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INTRODUCTION

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Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics. **627**

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Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology. **632**

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Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences. **636**

06 CHEMISTRY

Includes chemical analysis and identification (e.g., spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants. **638**

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Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation. **642**

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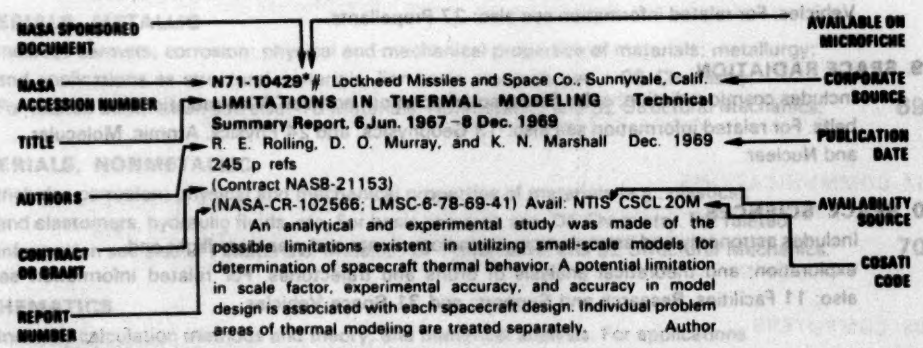
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An analytical and experimental study was made of the possible limitations existent in utilizing small-scale models for determination of spacecraft thermal behavior. A potential limitation in scale factor, experimental accuracy, and accuracy in model design is associated with each spacecraft design. Individual problem areas of thermal modeling are treated separately. Author

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Scientific and Technical Aerospace Reports

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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbo machinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N71-14501*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.

FIN LOADS AND CONTROL-SURFACE HINGE MOMENTS MEASURED IN FULL-SCALE WIND-TUNNEL TESTS ON THE X-24A FLIGHT VEHICLE

Ming H. Tang and V. Michael De Angelis Washington Nov. 1969 36 p refs

(NASA-TM-X-1922; H-580) Avail: NTIS CSCL 01A

Tests were conducted on the full-scale X-24A lifting body in a 40- by 80-foot wind tunnel. One purpose of the tests was to measure aerodynamic loads on the stabilizing fins and hinge moments on all the control surfaces. The tests were conducted at dynamic pressures of 60, 80, and 100 lb/sq ft. The effects of variations in rudder deflection, flap deflection, and angles of attack and sideslip were studied. Also, limited tests were performed with a simulated ablated coating over most of the vehicle to assess the effects of the ablated surface on the aerodynamic characteristics. Detailed results of the wind-tunnel tests are given in the form of load coefficients and hinge-moment coefficients. The results are compared with data from tests performed in other wind tunnels on small-scale models. Author

N71-14612# National Research Council of Canada, Ottawa (Ontario).

A STUDY OF PRESSURE DISTRIBUTIONS CALCULATED WITH THE SELLS METHOD ON A SERIES OF QUASI-ELLIPTICAL SYMMETRICAL AIRFOILS IN SUBCRITICAL FLOW

J. J. Kacprzynski Jun. 1970 39 p refs

(NRC-11693; LR-533) Avail: NTIS

Pressure distributions on seven quasi-elliptical profiles were calculated with Sells method, using different mesh sizes and smoothing parameters. The results are compared with Boerstoel's results obtained with Nieuwland's method for design flow conditions. Some results for off-design conditions are given. Proper use of Sells method is described and plots of the pressure distributions are included. Author

N71-14613*# Aerophysics Research Corp., Bellevue, Wash.

APPLICATION OF MULTIVARIABLE SEARCH TECHNIQUES TO THE DESIGN OF LOW SONIC BOOM OVERPRESSURE BODY SHAPES

D. S. Hague and R. T. Jones Nov. 1970 116 p refs

(Contract NAS2-4880)

(NASA-CR-73496) Avail: NTIS CSCL 01A

The Whitham–Lighthill method for describing the flow about a supersonic body of revolution is outlined and a computational method for locating shocks within the field is described. An outline of multivariable search procedures is presented in some detail. The method in which a series of body shaping problems are reduced to the multivariable optimization form is described. Several alternate multivariable optimization formats are employed including single and multiple-arc formations. Each formulation is exercised, and a series of low boom shapes are defined. Several of the multiple-arc solutions arrive at sonic boom overpressure values well below previously reported single-arc variational solutions. The practicality of these lower boom shapes is discussed; it is recommended that some of the more promising low boomshapes be tested with the objective of confirming their predicted characteristics. Author

N71-14614*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EFFECTS OF A RETRONOZZLE LOCATED AT THE APEX OF A 140 DEG BLUNT CONE AT MACH NUMBERS OF 3.00, 4.50, AND 6.00

Robert J. McGhee Washington Jan. 1971 40 p refs

(NASA-TN-D-6002; L-7312) Avail: NTIS CSCL 20D

Several distinct types of flow occurred on the cone, including two unsteady-flow regimes and two steady-flow regimes. Generally, the unsteady flows were restricted to low values of nozzle thrust and were observed at all angles of attack. The two steady-flow regimes occurred with increasing nozzle thrust; at the highest test values of nozzle thrust, the condition of no shear-layer reattachment on the cone was approximate. For the steady-flow regimes, the locations of the jet shock, flow interface, and bow shock together with the separation and reattachment pressures were all primarily functions of the nozzle-thrust coefficient. Because of the extensive flow separation and accompanying low pressure on the cone surface, only at the highest thrust values was the total drag (integrated-pressure drag coefficient plus nozzle-thrust coefficient) greater than the jet-off value of integrated-pressure drag coefficient. This result was obtained at all three test Mach numbers. Author

N71-14636*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

INVESTIGATION OF ENGINE-EXHAUST-AIRFRAME INTERFERENCE ON A CRUISE VEHICLE AT MACH 6

James M. Cubbage and Frank S. Kirkham Washington Jan. 1971 64 p refs

(NASA-TN-D-6060; L-6488) Avail: NTIS CSCL 01A

Results from an investigation of the effects of underexpanded

engine exhaust flow on the aerodynamic performance and stability of a cruise airplane at Mach 6 are presented. The influence of wing reflex angle and nozzle geometry on exhaust flow interference effects was investigated on a flat-plate model. The experiments were conducted at a free-stream Reynolds number of 17.05 × 1,000,000 based on the length of the airplane model over a model angle-of-attack range of 0 deg to 10 deg and at nozzle static-pressure ratios from 1 to approximately 4. Author

N71-14638*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AERODYNAMIC CHARACTERISTICS OF A LARGE-SCALE MODEL WITH A LIFT FAN MOUNTED IN A 5 PERCENT THICK TRIANGULAR WING, INCLUDING THE EFFECTS OF BLC ON THE LIFT FAN INLET

Brent K. Hodder, Jerry V. Kirk, and Leo P. Hall Washington Dec. 1970 56 p refs Prepared in cooperation with Army Air Mobility R and D Lab.

(NASA-TN-D-7031; A-2822) Avail: NTIS CSCL 01A

The low-speed aerodynamics of a large-scale triangular wing model, with a reduced thickness, tip-turbine driven lift fan in each wing were investigated in a 40- by 80-foot wind tunnel. The model had a 5-percent-thick wing typical of wings designed for supersonic performance. A thin lift fan for the investigation was obtained by modification of a conventional fan. The modification included removing the discharge stator and reducing the fan inlet length and radius. To control airflow separation resulting from small inlet radii, blowing boundary-layer control was applied through a nozzle in the inlet. Performance of the modified fan along with aerodynamic characteristics of the total configuration is presented. The static thrust performance of the conventional fan (requiring a 10-percent wing) was equalled by the reduced thickness of the modified fan. Author

N71-14669*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

NUMERICAL STUDY OF CONTROL OF DYNAMIC PROPERTIES OF A SUPERSONIC INLET USING BYPASS BLEED

Clarence W. Matthews Washington Jan. 1971 36 p refs

(NASA-TN-D-6144; L-7296) Avail: NTIS CSCL 20D

Several problems of supersonic-inlet control are discussed and it is decided that the use of an on-off bypass-door control system linked to a flow property just ahead of the door would be beneficial for the control of the flow. Results computed by using one-dimensional unsteady-flow characteristic methods are presented. These results show that the bypass-door control system will control the flow when the engine-face mass-flow requirement is reduced to 0.2 for various stall cycles or to 0.6 for a throttle-chop transient. The bypass-door results are compared with those from a perforated-wall system and with those from a combination of both systems. Author

N71-14672*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.

SINGLE-STAGE EXPERIMENTAL EVALUATION OF COMPRESSOR BLADING WITH SLOTS AND VORTEX GENERATORS. PART 4: SUPPLEMENTAL DATA FOR STAGE 4

J. A. Brent 29 Dec. 1970 97 p

(Contract NAS3-10481)

(NASA-CR-72778; PWA-FR-4135-Pt-4) Avail: NTIS CSCL 01A

Data tabulations are presented on overall performance and bleed flow, blade element performance, and nomenclature used for blade elements. For Vol. 1, see N70-25320; for Vol. 2, N70-22842; for Vol. 3, N71-10727. Author

N71-14740*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.

SINGLE-STATE EXPERIMENTAL EVALUATION OF COMPRESSOR BLADING WITH SLOTS AND VORTEX GENERATORS. PART 3: DATA AND PERFORMANCE FOR STAGE 4

J. A. Brent 29 Dec. 1970 216 p refs

(Contract NAS3-10481)

(NASA-CR-72741; PWO-FR-3840) Avail: NTIS CSCL 01A

Stage 4 of a series of highly loaded stages was tested without slots and with slots and/or vortex generators to determine the extent that these devices could extent the stable operating range of an 0.8 hub/tip ratio subsonic axial flow compressor stage. At design equivalent rotor speed, pressure ratio and efficiency of slotted stage 4 with and without vortex generators were lower than the results obtained with the unslotted stage. The addition of vortex generators upstream of the rotor and between the rotor and stator of a stage comprised of unslotted rotor 4 and slotted stator 4 produced at 10% increase in stage stall margin at design speed. The peak pressure ratio remained about the same both with and without vortex generators, whereas, the addition of vortex generators resulted in a slight increase in peak efficiency. Author

N71-14789# Pisa Univ. (Italy). Ist. di Meccanica Applicata e Construzione di Macchine.

INDUCED VIBRATION IN THE EXTERNAL FLOW OF A PRESSURIZED TUBULAR SYSTEM [VIBRAZIONI INDOTTE DAL FLUSSO ESTERNO IN SISTEMI DI TUBAZIONI IN PRESSIONE]

Enrico Manfredi [1968] 52 p refs In ITALIAN *Its* Ser. 26, No. 1269

(Rept-4) Avail NTIS

The state-of-the-art for predicting, and controlling the phenomena of vibration in the external flow of tubular systems is reviewed. The fundamental mechanisms of these vibrations are analyzed; theoretical and experimental results relative to the problem of dimensions are presented. Transl. by F.O.S.

N71-14943*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

LOW-SUBSONIC AERODYNAMIC CHARACTERISTICS OF A SHUTTLE-ORBITER CONFIGURATION WITH A VARIABLE-DIHEDRAL DELTA WING

George M. Ware and Bernard Spencer, Jr. Washington Jan. 1971 44 p refs

(NASA-TM-X-2206; L-7566) Avail: NTIS CSCL 01A

An investigation has been conducted a low-turbulence pressure tunnel to determine the subsonic aerodynamic characteristics of a shuttle-orbiter configuration with a variable-dihedral delta wing. The tests were made at Reynolds numbers, basedon body length, 4.50 × 1 million to 26.54 × 1 million; the angles of attack varied from about −4 deg to 20 deg at 0 deg and 5 deg of sideslip. The variable investigated included the effects of wing dihedral angle, elevon deflection for pitch and roll control, vertical-tail size. Author

N71-14945*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

LOW-SPEED LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF A MODEL OF A BLUNT-NOSE HYPERSONIC LIFTING SPACECRAFT HAVING VARIABLE-SPEED WINGS

Bernard Spencer, Jr. Washington Jan. 1971 31 p refs

(NASA-TM-X-2102; L-7357) Avail: NTIS CSCL 01A

An investigation has been made at low subsonic speeds of a model of a low-fineness-ratio lifting-body logistic spacecraft concept designed for a hypersonic lift-drag ratio near 1. Variable-sweep wings were employed and mounted in a low position. Tests were made in a low turbulence pressure tunnel at a Mach number of 0.21 and a Reynolds number of 30.4 × 1 million, based

on model reference length. Angle of attack was varied from about −4 deg to 18 deg at 0 deg of sideslip. Author

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N71-14526*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.

OPERATIONAL EXPERIENCES AND CHARACTERISTICS OF THE M2-F2 LIFTING BODY FLIGHT CONTROL SYSTEM

Weneth D. Painter and Erwin M. Kock Washington Jun. 1969 31 p refs

(NASA-TM-X-1809) Avail: NTIS CSCL 01A

Flights of the M2-F2 lifting body demonstrated that the manual control system and the stability augmentation system met the operational flight control requirements for the test vehicle. The regions of pilot-induced oscillation predicted from ground simulation were encountered in flight. The pilots considered the control system to be adequate for the M2-F2 flight envelope flown. Limit-cycle data obtained during ground tests agreed with flight results. Author

N71-14527*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.

INTERIM RESULTS OF THE LIFTING-BODY FLIGHT-TEST PROGRAM

Garrison P. Layton, Jr. Washington Jul. 1969 26 p refs Presented at AIAA Entry Vehicle Systems and Technol. Meeting, Hampton, Va., 3–5 Dec. 1968

(NASA-TM-X-1827) Avail: NTIS CSCL 01A

The significant results of the joint NASA/U.S. Air Force lifting-body flight-test program are presented in general terms, based on unpowered M2-F2 and HL-10 flights. The lifting-body flight-test program demonstrated that lifting reentry vehicles can be maneuvered to an unpowered landing from initial conditions representing the entry of the terminal area for a reentry vehicle. Wind-tunnel predictions of the aerodynamic characteristics of these shapes up to a Mach number of approximately 0.7 were in fair agreement with flight data, with some notable exceptions. The predictions tended to be low on stability and control effectiveness and did not predict trim to the accuracy desired, nor the severity of separated flow over the aft part of the HL-10 vehicle. The flight simulators and pilot-in-the-loop theoretical analysis accurately predicted the handling characteristics, but conventional handling-qualities criteria do not necessarily apply to lifting reentry vehicles. Author

N71-14555# Army Command and General Staff Coll., Fort Leavenworth, Kans.

SOVIET CIVIL AIR TRANSPORT: AN APPRAISAL

Gilbert E. Jones May 1970 120 p refs

(AD-713415) Avail: NTIS CSCL 1/2

The purpose of the study is to provide a comprehensive description of civil air transport in the USSR and to offer an appraisal of its contemporary status. Although a brief historical sketch of Soviet civil aviation has been included, the study concentrates on the 1960-1970 period. The organizational structure, operational procedures, the commercial aircraft inventory, and the prospects for future development are the major features of Soviet civil air transport that are examined. Author (TAB)

N71-14558# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.

FLIGHT EVALUATION OF THE EFFECTS OF SHORT PERIOD FREQUENCY AND NORMAL ACCELERATION RESPONSE IN CARRIER APPROACH Final Report, Apr.–Jun. 1969

Edward Seckel and George E. Miller Nov. 1969 37 p refs

(Contract Nonr-1858(50); Grant NSF GP-579)

(AD-713125) Avail: NTIS CSCL 1/2

The results of an aircraft flying qualities research program are presented. Navy test pilot evaluations in the form of pilot ratings and specific comments of several longitudinal handling characteristics were obtained for a simulated carrier landing task. The investigation made use of a variable stability aircraft which accurately simulated the longitudinal short period response characteristics and the effects of atmospheric turbulence. The flying qualities associated with variations in short period frequency, lift curve slope, and the use of direct lift control are presented. The data are compared with similar data obtained from flight and ground simulator tests. All configurations tested were found to be acceptable for the daylight visual carrier approach task, and only minor differences in the flying qualities of the configurations were evident. Author (TAB)

N71-14559# Army Natick Labs., Mass.

THE INTERNAL AND EXTERNAL FLOW FIELD ASSOCIATED WITH PARACHUTES DURING INFLATION

Gregory C. De Santis 1970 15 p refs

(AD-713520) Avail: NTIS CSCL 1/3

A hot-wire anemometer was used to obtain data on the flow field associated with an inflating parachute. Seven models simulating various stages of inflation of the C-9 parachute were fabricated and tested in a specially constructed test section where the temperature could be held uniform. Using this method, it was possible to accurately measure the internal and external flow surrounding the canopy. Some possible applications of the data to full-scale parachute systems are presented. Author (TAB)

N71-14564# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EXTERNAL LOADS AND THE STRENGTH OF FLIGHT VEHICLES

A. I. Gudkov et al 3 Sep. 1970 120 p refs Transl. into ENGLISH from the Russian

(AD-713461; FTD-MT-24-64-70) Avail: NTIS CSCL 1/3

Contents: Loads during landing and ground movement; Action of dynamic loads on the construction; Application of computers for investigation of dynamic loading of constructions. TAB

N71-14585# Army Electronics Command, Fort Monmouth, N.J.

A STUDY OF THE DYNAMIC MOTIONS OF HINGELESS ROTORED HELICOPTERS

Norman K. Shupe Aug. 1970 265 p refs

(AD-713402; ECOM-3323) Avail: NTIS CSCL 1/3

The hingeless rotor is modeled as a system of thin cantilevered members, infinitely stiff in torsional and chordwise bending, executing pure elastic flapwise bending. It is shown that to model the rotor from hover thru high speed flight, the motions of a blade must be represented by its first two natural modes of flapwise bending. For this blade model, it is also shown that the hub moment developed is linearly related to the tip path plane tilt in hover but that the relationship becomes markedly nonlinear with increasing forward speed. Consideration is also given to the effects of a non-uniformly distributed induced velocity field.The characteristics of the Lockheed gyro stabilization system are compared to those of the Bell gyro system and a conventional electronic stabilization system utilizing body mounted sensors. Author (TAB)

N71-14591*# McDonnell-Douglas Co., Long Beach, Calif.
INVESTIGATION OF DC-8 NACELLE MODIFICATIONS TO REDUCE FAN-COMPRESSOR NOISE IN AIRPORT COMMUNITIES. PART 6: PSYCHOACOUSTIC EVALUATION Technical Report, May 1967–Mar. 1970
Lawrence E. Langdon, Richard F. Gabriel, and Alan H. Marsh Washington NASA Dec. 1970 44 p refs
(Contract NAS1-7130)
(NASA-CR-1710) Avail: NTIS CSCL 01B

Nacelle modifications intended to reduce fan-compressor noise emitted from DC-8-50/61 airplanes were fabricated and flight tested. Subjective reaction to the flyover noise of these nacelle modifications was assessed by asking 41 college students to judge the acceptability of the sound of existing and modified aircraft as reproduced in an anechoic chamber. The method of constant stimulus differences was used to assess pairs of stimuli. Each pair consisted of one recording from each aircraft. Sounds recorded outdoors and indoors were included. Operational conditions were tested that represented takeoff, reduced-climb-gradient, and landing-approach thrusts at nominal heights ranging from 500 to 2500 feet. The most important findings were: (1) Improvements were noted for all heights and thrusts investigated, (2) For the landing-approach thrust condition, the judged improvement in the noise due to the installation of modified nacelles ranged from 11 to 14 EPNdB over the range of heights investigated, and (3) The effective-perceived-noise-level noise-rating scale adequately assessed the improvement in acceptability. Author

N71-14592*# McDonnell-Douglas Co., Long Beach, Calif.
INVESTIGATION OF DC-8 NACELLE MODIFICATIONS TO REDUCE FAN-COMPRESSOR NOISE IN AIRPORT COMMUNITIES. PART 5: ECONOMIC IMPLICATIONS OF RETROFIT Technical Report, May 1967–Oct. 1969
H. D. Whallon, Ellis J. Gabbay, G. B. Ferry, Jr., and N. L. Cleveland Washington NASA Dec. 1970 57 p refs
(Contract NAS1-7130)
(NASA-CR-1709) Avail: NTIS CSCL 01A

The economic effects of retrofitting the airplanes with modified nacelles were studied for an assumed fleet of DC-8-50/61 airplanes in passenger service. These airplanes are equipped with nacelles having short fan-exhaust ducts. Estimates were made of the initial costs of retrofitting the airplanes with modified nacelles, and of the effects of the modifications on direct operating cost, profit, taxes, airplane investment, and return on airplane investment. In addition, estimated effects of the modifications on basic airplane performance characteristics were considered. These calculated performance characteristics (and the calculations of direct operating cost) were based on flight test results obtained in the third phase of the program. An economic life of 5 years was assumed for the retrofit kits on series 50 airplanes and 5 and 10 years on model 61 airplanes. The study indicated that direct operating cost would be increased between 4 and 5 percent, assuming a 5-year amortization of the retrofit cost and modification of all short-duct DC-8 airplanes. Doubling the amortization period would approximately halve the increase in direct operating cost. The increase in direct operating cost would be due almost entirely to amortization of the costs of modification. On the assumption that operating revenues would be the same for the existing and treated airplanes, calculations indicated that profit after taxes and federal income taxes would be reduced about 10 percent for 5 years, the investment book value of airplane inventory would be increased 18.5 percent, and the discounted cash flow rate of return on airplane investment would be reduced about 8 percentage points, about a one-quarter reduction from the existing level. Author

N71-14593*# McDonnell-Douglas Co., Long Beach, Calif.
INVESTIGATION OF DC-8 NACELLE MODIFICATIONS TO REDUCE FAN-COMPRESSOR NOISE IN AIRPORT COMMUNITIES. PART 3: STATIC TESTS OF NOISE SUPPRESSOR CONFIGURATIONS, MAY 1967 – OCTOBER 1969
J. Kenneth Manhart, D. A. Campbell, C. A. Henry, and E. M. Lowder Washington NASA Dec. 1970 173 p refs
(Contract NAS1-7130)
(NASA-CR-1707) Avail: NTIS CSCL 21E

Four acoustically treated inlet-duct configurations, a simulated variable-area primary nozzle, and one set of acoustically treated fan-exhaust ducts were fabricated, tested, and evaluated. The test articles were installed on a JT3D turbofan engine mounted on an engine test stand. Far-field sound pressure levels (at a distance of 150 ft from the engine) and engine-performance data were obtained to evaluate the performance of the test configurations. The objective of the tests was to reduce the perceived noise level during the landing approach of DC-8-50/61 airplanes. The goal of the program was a 7 to 10 PNdB reduction in perceived noise level under the landing-approach path with no increase in noise under the takeoff flight path. The reduction in perceived noisiness was to be obtained through significant reduction in the discrete-frequency tones radiated from the inlet and fan-exhaust ducts. As a result of acoustical and engine performance evaluations, a treated-nacelle configuration, consisting of a treated one-ring inlet and treated 48-inch-long fan-exhaust ducts, was selected for flight testing. The selected configuration was estimated to be able to meet the 7 to 10 PNdB noise-reduction design goal. Author

N71-14594*# McDonnell-Douglas Co., Long Beach, Calif.
INVESTIGATION OF DC-8 NACELLE MODIFICATIONS TO REDUCE FAN-COMPRESSOR NOISE IN AIRPORT COMMUNITIES. PART 2: DESIGN STUDIES AND DUCT-LINING INVESTIGATIONS, MAY 1967 – OCTOBER 1969
Alan H. Marsh, R. L. Frasca, D. K. Gordon, C. A. Henry, G. L. Laurie, et al Washington NASA Dec. 1970 198 p refs
(Contract NAS1-7130)
(NASA-CR-1708) Avail: NTIS CSCL 21E

Designs for two fan-exhaust ducts and eight inlet ducts applicable to the JT3D turbofan engines on DC-8-50/61 airplanes were studied. The designs were evaluated in terms of (1) their estimated ability to produce a 7 to 10 PNdB reduction in perceived noise level during landing approach and (2) their estimated impact on direct operating costs. Two inlet-duct designs and one fan-exhause-duct design were selected for ground static testing. One of the inlet designs incorporated acoustically absorptive linings on the walls of a revised inlet duct, two concentric ring vanes, and a lengthened centerbody. The other design had treatment on the walls of a lengthened inlet duct, one concentric ring vane, and an enlarged lightbulb-shaped centerbody. The fan-exhaust duct design provided acoustical linings in an exhaust duct 24 inches longer than the existing ducts, thus requiring a new fan thrust reverser but preserving the existing primary thrust reverser. Acoustical duct-lining studies consisted of: flow resistance; acoustic absorption and impedance; duct transmission-loss; and sonic-fatigue tests. Structural duct-lining studies consisted of: determination of structural design criteria for duct linings; structural tests of bonded honeycomb sandwich structures; and development of fabrication procedures for duct linings. The result of these acoustical and structural studies was the selection of the materials and fabrication processes used in contructing the test articles for the ground static tests. Author

N71-14595*# McDonnell-Douglas Co., Long Beach, Calif.
INVESTIGATION OF DC-8 NACELLE MODIFICATIONS TO REDUCE FAN-COMPRESSOR NOISE IN AIRPORT COMMUNITIES. PART 1: SUMMARY OF PROGRAM RESULTS Technical Report, May 1967–Mar. 1970
Robert E. Pendley and Alan H. Marsh Washington NASA Dec. 1970 38 p refs
(Contract NAS1-7130)

(NASA-CR-1705) Avail: NTIS CSCL 01B

An investigation was conducted of methods to reduce fan-compressor noise from the JT3D-3B engines of DC-8 aircraft equipped with short duct nacelles. The purpose of the investigation was to define modifications that could be applied to the nacelles of operational aircraft to reduce the perceived noise level by 7 to 10 PNdB under the landing approach path without adverse effects on takeoff noise. The program included laboratory investigations, full-scale ground tests, and flight tests. Author

N71-14598*# Boeing Co., Seattle, Wash.

STUDY AND DEVELOPMENT OF TURBOFAN NACELLE MODIFICATIONS TO MINIMIZE FAN-COMPRESSOR NOISE RADIATION. VOLUME 1: PROGRAM SUMMARY, 1 MAY 1967–1 NOVEMBER 1969

Washington NASA Jan. 1971 38 p refs

(Contract NAS1-7129)

(NASA-CR-1711) Avail: NTIS CSCL 21E

The results of a flight evaluation of an acoustically treated nacelle installed on the JT3D turbofan engines on a Boeing 707-320C airplane and the economic impact of this installation are discussed. The program objective was a PNL reduction of 15 PNdB to landing approach noise which was accomplished by installing two acoustically treated rings in the engine inlet and by acoustically treating an extended length fan duct configuration. The acoustic treatment consisted of a polyimide-fiberglass sandwich material. A detail description of the nacelle is presented and a summary of the acoustic and performance results of the flight evaluation are presented. In addition, the structural-mechanical aspects and the impact on operational factors are reviewed. Both operating costs and impact on airline operations based on retrofit of these nacelles are reviewed in the economic analysis. Author

N71-14600*# Serendipity, Inc., Palo Alto, Calif.

IMPROVED DISPLAY SUPPORT FOR FLIGHT MANAGEMENT DURING LOW VISIBILITY APPROACH AND LANDING. A SIMULATOR EVALUATION OF AN ILS-INDEPENDENT RUNWAY PERSPECTIVE DISPLAY Final Report

Walter B. Gartner and Kenneth M. Baldwin Nov. 1970 97 p refs

(Contract NAS2-5851)

(NASA-CR-73495; TR386-70-01) Avail: NTIS CSCL 01B

A preliminary evaluation of an ILS-indepsendent, pictorial runway perspective display concept was conducted. The improvement which might be realized in the accuracy of flight management task performance was determined. Six senior airline pilots flew a total of 180 simulated approach and landing sequences using three different displays as the basis for approach assessment tasks. The three alternate display concepts were designed to provide increasing levels of directness in representing the flight situation parameters relevant to the flight management task. Author

N71-14604# Army Aeronautical Research Lab., Moffett Field, Calif.

MASS FLOW, VELOCITY AND IN-FLIGHT THRUST MEASUREMENTS BY ION DEFLECTION

C. Rande Vause and Robert S. Rudland 1970 15 p refs

(AD-713587) Avail: NTIS CSCL 1/4

An investigation was made of the use of gaseous (ion) discharge sensors to achieve adequate measure of aircraft velocity and installed thrust. Author (TAB)

N71-14608*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

WIND-TUNNEL INVESTIGATION OF A JET TRANSPORT AIRPLANE CONFIGURATION WITH AN EXTERNAL-FLOW JET FLAP AND INBOARD POD-MOUNTED ENGINES

Delma C. Freeman, Jr., Lysle P. Parlett, and Robert L. Henderson Washington Dec. 1970 122 p refs

(NASA-TN-D-7004; L-7403) Avail: NTIS CSCL 01A

A wind tunnel investigation was conducted to determine the aerodynamic, stability, and control characteristics of a jet transport airplane configuration with an external-flow jet flap and four pod-mounted engines. Major emphasis of the investigation was placed on determining the effectiveness of close-inboard mounting of the engines as a means of reducing the large engine-out moments inherent in an external-flow jet-flap system and of evaluating the use of asymmetric blowing on drooped ailerons or the use of differential flap deflection as a means of providing trim to offset the engine-out moments. Author

N71-14629# State Committee for Civilian Construction and Architecture, Moscow (USSR).

THE USE OF DIRIGIBLES IN CONSTRUCTION [DIRIZHABLI NA STROYKAKH]

T. I. Alekseyeva and N. A. Brusentsev 1968 56 p refs In RUSSIAN

Avail: NTIS

The prospective application of dirigibles in the national economy is discussed, with special emphasis on their use in construction. The engineering and operational aspects of dirigibles are considered and the technical and economic characteristics of dirigible development, both domestic and foreign, are investigated. Transl. by R.B.

N71-14634*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

DYNAMIC STABILITY DERIVATIVES OF A TWIN-JET FIGHTER MODEL FOR ANGLES OF ATTACK FROM −10 DEG TO 110 DEG

Sue B. Grafton and Charles E. Libbey Washington Jan. 1971 38 p refs

(NASA-TN-D-6091; L-7370) Avail: NTIS CSCL 01A

A low-speed investigation was conducted to determine the dynamic stability derivatives in pitch, roll and yaw over an angle-of-attack range of −10 deg to 110 deg for a twin-jet swept-wing fighter model. Several frequencies and amplitudes were investigated to determine the effects of these variables on the stability derivatives. The effect of the vertical and horizontal tail, and horizontal-tail incidence on the derivatives were also evaluated. The results indicate that the model exhibited stable values of damping in pitch over the entire angle-of-attack range, but marked reductions of damping in roll were measured at the stall, and unstable values of damping in yaw were present for the very high angles of attack associated with flat spins. Either removal of the horizontal or vertical tail or full deflection of the horizontal tail eliminated the unstable characteristics of the damping-in-yaw derivatives. Author

N71-14701# Toronto Univ. (Ontario). Inst. for Aerospace Studies.

AN ASSESSMENT OF STOL TECHNOLOGY

Nov. 1970 290 p refs Prepared for Can. Transport Comm.

(UTIAS-162) Avail: NTIS

A study of STOL technology is presented in an attempt to identify impedances to the introduction of a Canadian STOL transport system. Five route types are considered (intercity, municipal feeder, downtown to airport, regional, and northern) and five major aspects of STOL are investigated (vehicle design and performance, operational aspects, navigation/guidance/air traffic control, nonpassenger public acceptance, and STOLports). As an aid in determining the viability of a Canadian system, economic models are developed for all but the regional application. These models are applied to typical Canadian routes and the results presented in tabular and graphical form. An extensive bibliography covering all

aspects of the STOL field has been compiled in support of this study and is included. Based on an analysis of the available information it is concluded that no major technological impedances exist that will prevent the introduction of a first generation STOL transport system based upon STOLports at grade level and turboprop vehicles with light wing loadings. However, the acceptance of such a system by the non-passenger public is not certain. Author

N71-14734*# Israel Program for Scientific Translations, Ltd., Jerusalem.
FIFTY YEARS OF SOVIET AIRCRAFT CONSTRUCTION
A. S. Yakovlev 1970 193 p refs Transl. into ENGLISH of the Book "50 Let Sovetskogo Samoletostroeniya" Moscow, Izdatel'stvo Nauka, 1970 p 1–186 Sponsored by NASA and NSF
(NASA-TT-F-627; TT-70-50076) Copyright. Avail: NTIS CSCL 01C

A history of U.S.S.R. aviation development and aircraft construction during a fifty year period is presented. Subjects discussed are: (1) aircraft design, (2) engine design, (3) industrial facilities, (4) civil aviation, (5) military aviation, and (6) accomplishments of flying personnel. Author

N71-14811# Schjeldahl (G. T.) Co., Northfield, Minn.
DESIGN AND MANUFACTURE OF COMPOSITE, ISOTENSOID, NATURAL SHAPE BALLOONS Final Report, May 1966–Sep. 1969
James B. Munson 15 Dec. 1969 70 p refs
(Contract AF 19(628)-5987)
(AD-713188; AFCRL-70-0498; Rept-0034) Avail: NTIS CSCL 1/3

A method is presented for arranging filamentary, load bearing material to approximate a constant stress condition in the gas envelope of a free floating balloon for the purpose of maximizing structural efficiency. A relation between material distribution and envelope stress was obtained. Manufacturing equipment was developed and a natural shape, zero pressure constant stress balloon was fabricated and tested. Author (TAB)

N71-14835# Little (Arthur D.), Inc., Cambridge, Mass.
A STUDY OF AIR TRAFFIC CONTROL SYSTEM CAPACITY Interim Report, Sept. 1969–Aug. 1970
Gordon Raisbeck, Bernard O. Koopman, Simon F. Lister, and Asha S. Kapadia Oct. 1970 164 p refs
(Contract FA-70-WA-2141)
(FAA-RD-70-70) Avail: NTIS

The long-range objective of the program is to develop tools and techniques to define, measure, and predict the quantitative capacity of an air traffic control system, which can then be used in analytical studies in support of long-range plans, management decisions, and system performance evaluations. In the context of functional descriptions of air traffic control, the concepts of air traffic control system capacity include the following: (1) A functional description of air traffic control which is applicable to a wide range of system concepts, including the present system and many suggested variations and alternatives, is feasible. (2) The mathematical theory of time-varying queues is an important, useful tool. (3) The quantitative study of safety is highly relevant to ATC capacity, but must be studied indirectly rather than through accident statistics. (4) Simple, straightforward definitions of concepts, such as capacity, demand, delay, and safety, are unlikely, but the need for them can be satisfied by families of less comprehensive terms. Author

N71-14944*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN APPROACH TO THE DETERMINATION OF AIRCRAFT HANDLING QUALITIES BY USING PILOT TRANSFER FUNCTIONS
James J. Adams and Howard G. Hatch, Jr. Washington Jan. 1971 29 p refs
(NASA-TN-D-6104; L-7336) Avail: NTIS CSCL 01A

It is shown that a correlation exists between longitudinal closed-loop characteristics of a pilot-aircraft system (determined by using pilot models to represent the pilot) and pilot ratings obtained in flight tests. It is therefore concluded that pilot ratings can be predicted on the basis of the various levels of complexity of the models and the closed-loop system characteristics used in demonstrating the correlation. Author

N71-15698*# California Univ., Davis. Dept. of Mechanical Engineering.
CONTROL POWER REQUIREMENTS OF VTOL AIRCRAFT, PHASE 1 STUDY Final Report, Apr. 1969–Sep. 1970
M. A. Hoffman, W. V. Loscutoff, and J. Seevers Nov. 1970 208 p refs
(Grant NGR-05-004-051)
(NASA-CR-115907) Avail: NTIS CSCL 01A

A two part program is reported aimed at the development of a modern guidance, control, and stabilization system for the VTOL aircraft. The first part of the program deals with design and cost aspects of three specific types of VTOL transports. The three types of VTOL's selected were a tilt-wing design and two pure-jet-lift designs, one with all lift engines in the fuselage and the other with the lift engines in wing pods. Computer programs were written to design the vehicles and calculate the direct operating costs for each of the three types. The data obtained was used to assess the cost of increasing the installed propulsive power for control purposes. The second part of the investigation focused on the control problems of VTOL transports. A study was initiated to explore several promising analytical control system design techniques with the initial effort being directed toward VTOL hover control systems. The various types of control methodology are described and results of the system design study are given. D.L.G.

03 AUXIL'ARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines; hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; 22 Nuclear Engineering; and 28 Propulsion Systems.

N71-14606*# TRW Systems Group, Redondo Beach, Calif.
STUDY TO ESTABLISH CRITERIA FOR A SOLAR CELL ARRAY FOR USE AS A PRIMARY POWER SOURCE FOR A LUNAR-BASED WATER ELECTROLYSIS SYSTEM, PHASE 3 Final Technical Report, 15 Nov. 1969–15 Dec. 1970
J. E. Boretz 15 Dec. 1970 259 p refs
(Contract NAS8-21189)
(NASA-CR-102984; TRW-09881-6007-R000) Avail: NTIS CSCL 10B

Emphasis during this phase of the program was: (1) evaluation of spalling phenomenon observed during thermal vacuum testing; (2) design of an improved cellstack interconnect and submodule bus-bar configuration less sensitive to solder wicking action and fatigue; (3) determination of the adequacy of the cell-to-substrate adhesive bond strength with regard to both structural/dynamic and thermal vacuum loads; and (4) an evaluation of the structural integrity of the overall candidate substrate/cellstack configuration to assess the compatibility of the interactions between all the array module components. A.L.

N71-14807# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.
OPEN CYCLE HYDROCARBON-AIR FUEL CELL POWER PLANT
Edward A. Gillis, Fred O. Kezer, Jr., and Walter G. Taschek 1970 15 p refs
(AD-713528) Avail: NTIS CSCL 10/2

Discussed are various types of fuel cells suitable for front line warfare communication systems. Mentioned is the hydrocarbon-air fuel cell and various electrolytes including phosphoric acid. TAB

N71-14808*# Rocketdyne, Canoga Park, Calif.
INVESTIGATION OF ELECTROLYTE SYSTEMS FOR LITHIUM BATTERIES Final Report, 28 May 1969–28 Jul. 1970
Rudolf Keller and John F. Hon Jul. 1970 263 p refs
(Contract NAS3-12969)
(NASA-CR-72803; R-8368) Avail: NTIS CSCL 10C

Aprotic electrolytes based upon methyl formate, propylene carbonate, and dimethyl formamide as solvents and lithium chloride plus aluminum chloride, lithium hexafluoroarsenate, and lithium perchlorate as solutes were studied. Well characterized components were used to prepare solutions. The effect of additives, other aprotic solvents, other salts and, in some cases, small amounts of water, on species in solution and physical properties was investigated. Physical properties investigated included conductance, solubilities, and stability in the presence of lithium. Author

N71-14810# Centre National de la Recherche Scientifique, Odeillo (France). Lab. des Ultra-Refractaires.
REMARKS CONCERNING SOLAR FURNACES IN SPACE
M. Hoez and M. Foex 1970 5 p refs Presented at the Solar Energy Soc. Conf., Melbourne, 2–6 Mar. 1970 /its Paper No. 8/10
(CONF-700330-2) Avail: AEC Depository Libraries

The possibility of employing solar furnaces in conjunction with the high vacuum of space is examined. Production of high purity products in space, and the inherent difficulties, are considered. NSA

N71-14846# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.
EXPERIMENTAL SUPERCONDUCTING ALTERNATORS WITH IRON-CORE AND IRON-FREE ARMATURES
James H. Ferrick and Carl J. Heise 1970 12 p refs
(AD-713523) Avail: NTIS CSCL 10/2

Iron-core and iron-free alternators employing super-conducting field windings have been designed and constructed. The design equations have been verified experimentally. The machines have been performance tested and their terminal characteristics obtained. Results indicate a need to carefully consider eddy current losses in copper conductors for designs in which the windings are exposed to peak magnetic flux changes. The advantages of using ferromagnetic materials in designs in which saturation flux densities are not encountered are illustrated. Author (TAB)

N71-14849# Army Foreign Science and Technology Center, Washington, D.C.
FLYING WEIGHT OF AN AIRCRAFT GENERATOR [POLETHYY VES SAMOLETNOGO GENERATORA]
D. I. Zaslavskiy 3 Jun. 1970 11 p refs Transl. into ENGLISH from Elektrotekhnika (USSR), v. 39, no. 4, 1968 p 4–6
(AD-713782; FSTC-HT-23-437-70) Avail: NTIS CSCL 10/2

Expressions for calculating the flight weight of an aircraft generator using various cooling systems and with different generator drives have been formulated. The methods of calculating flight weight are cited in this article. TAB

N71-14852*# Lockheed-Georgia Co., Dawsonville. Nuclear Lab.
STUDY OF THE EFFECTS OF RADIATION ON LITHIUM DOPED SOLAR CELLS Semiannual Report
May 1970 33 p Prepared for JPL
(Contracts NAS7-100; JPL-952586)
(NASA-CR-115889) Avail: NTIS CSCL 10B

The facilities specially designed and fabricated to be used in an experimental investigation of electron radiation effects on lithium p-on-n-type silicon solar cells are described. The environmental chamber, temperature control system, light source, electron source, solar cell characteristics, and data acquisition system are discussed in detail. Author

N71-14881# Rutgers Univ., New Brunswick, N.J. School of Chemistry.
RELATIVE CATION MOBILITIES IN SILVER BROMIDE-POTASSIUM BROMIDE MELTS
Richard W. Leity and Albert S. Tenney [1970] 19 p refs Sponsored in part by AEC
(NYO-3608-11) Avail: NTIS

D. C. Transference experiments have been used to compare the rates of cation migration relative to bromide at a number of temperatures and concentrations of the system AgBr-KBr. Individual cation conductance isotherms have been calculated from a combination of these data with Lambda values for the same mixtures. Both mobilities decrease with decreasing concentration of AgBr, that of the initially more mobile silver ion falling considerably more rapidly. The resulting crossover point shifts toward higher concentrations of AgBr as temperature increases. Although no frits or other porous materials were employed in this work, the observed behavior is remarkably similar to that found in previous transference experiments on other binary mixtures. It is contrary, however, to the equality of cation mobilities at all concentrations implied by some emf values reported in the literature for AgBr-KBr concentration cells with transference. Author

N71-14711# Communications Satellite Corp., Clarksburg, Md.
SOLAR CELL RESEARCH AT COMSAT
D. J. Curtin 1970 6 p refs Presented at Intern. Solar Energy Conf., Melbourne, 1970
(CONF-700330-1) Avail: AEC Depository Libraries

A survey of the solar cell research program at COMSAT Laboratories is presented. The results discussed include data from studies of low energy proton irradiations on partially shielded silicon solar cells, 1 MeV electron irradiations on silicon solar cells, and proton irradiations and thermal cycling of cadmium sulfide solar cells. Author (NSA)

N71-14712# Gulf General Atomic, San Diego, Calif.
THERMOELECTRIC GENERATORS FOR SPACE MISSIONS, PART 2, SUPPLEMENT A Annual Summary Report, 1 Jul. 1968–30 Jun. 1969
G. B. Bradshaw 1 Apr. 1970 75 p refs
(Contract AT(29-2)-2564)
(GA-9515-Pt-2-Suppl-A) Avail: NTIS

An exploratory degradation investigation of ISOTEC thermoelectric elements typical of those to be used in the TRANSIT RTG is described. Degradation mechanisms through the interpretation of element life-test data, element geometry changes, and through estimates of potential porosity buildup were found. Additionally, literature has been reviewed in an effort to relate observed changes to those reported by other investigators and for the purpose of estimating the relationship between thermal and electrical resistance changes. One of the major study objectives, besides elemental performance analysis, was to bracket the expected changes due to various degradation modes. Results of porosity

evaluation indicated that resistance will change nearly proportionally to the increase in porosity, and will rise only a few percent due to typical trends of porosity redistribution. Author (NSA)

N71-14946*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
BATTERY STORAGE OPTIMIZATION AND DESIGN STUDIES
R. S. Bogner and R. E. Patterson 15 Dec. 1970 12 p
(Contract NAS7-100)
(NASA-CR-115901; JPL-TM-33-462) Avail: NTIS CSCL 10C

Sealed Ag-Zn cells with five different separator systems from four different vendors, and one group of Ag-Cd cells, were tested to evaluate their capability of maintaining a predictable output after long periods of inactivity. Electrolyte concentration was included as a variable in two of the cell designs. The cells were grouped into sets of three for storage at six different temperatures and four different time intervals. Extrapolation of rate capacity loss data at low temperature storage (0 to −20 C) indicates that after ten years of storage most of the cell designs would deliver 75% of their original capacity. Cells with the RAI-116 separator system showed the best charge retention. Cells of the one Ag-Cd design did not maintain charge retention as well as most of the Ag-Zn cells. Author

N71-14947*# Honeywell, Inc., Montgomeryville, Pa. Livingston Electronic Lab.
HIGH ENERGY DENSITY PRIMARY BATTERIES Interim Report, 20 Jun. 1969 – 30 Jun. 1970
R. J. Horning and W. R. Beck Jul. 1970 108 p
(Contract NAS3-13221)
(NASA-CR-72776) Avail: NTIS CSCL 10C

Experimental work on mapping the performance characteristics of the CuF2/LiAsF6-MF/Li electrochemical system and its regions of optimum performance as a function of cell design and operation variables is being conducted. At present 180 whrs/lb has been achieved at 40 C at a discharge rate of 9 ma/sq cm in a 2-3/4 inch × 4 inch seven-plate cell. Electrical performance is, at present, primarily altered by temperature and discharge rate; however, other factors, such as cathode water, separator thickness, and percent carbon also appear to have significant effects. Author

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N71-14571# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
OLD AND NEW DATA ON TONE PERCEPTION
Reinier Plomp 1970 59 p refs
(TDCK-56077-16; IZF-1970-14) Avail: NTIS

Experiments in the physiological aspects of tone perception are discussed. The experiments treated concern, successively: (1) the ear's ability to distinguish the sinusoidal components of a complex sound, (2) the dependence of timbre as a multidimensional attribute of complex sounds upon the amplitude pattern and the phase pattern of the harmonics, (3) the occurrence of combination tones as products of the ear's nonlinearity, (4) the occurrence of beats between sinusoidal tones with frequency ratios slightly different from m:n (m, n small integers) as evidence for the ear's phase sensitivity, and (5) the dependence of tonal consonance and dissonance of simultaneous complex tones on critical bandwidth. Author

N71-14572# Oak Ridge National Lab., Tenn.
APPLIED HEALTH PHYSICS AND SAFETY Annual Report, 1969
Aug. 1970 68 p refs
(Contract HW-7405-eng-26)
(ORNL-4563) Avail: NTIS

There were no accidental releases of gaseous or liquid waste from the Laboratory that were of a reportable level as defined in AEC Manual Chapter 0524. The concentration of radioactive materials in the environs was well below the maximum levels recommended by the ICRP, FRC, and AEC. No employees received an external or internal radiation dose of a level that required a report to the AEC. The highest whole-body dose received by an employee was about 3.8 rem or 32% of the maximum permissible annual dose. There were no cases of internal exposure where the deposition of radioactive materials within the body was estimated to have averaged greater than one-half of a maximum permissible body burden. There were 12 unusual occurrences recorded during 1969, which is the lowest number recorded since the present system of reporting unusual occurrences was established in 1960. The second lowest number for any one year was 16, the number reported for 1967. The average number reported for the past five years was 22. Author (NSA)

N71-14573# Brandeis Univ., Waltham, Mass.
[ON PROPERTIES OF X-IRRADIATED lambda PHAGES] Progress Report, 1 Jan. – 30 Jun. 1970
David M. Freifelder 15 Jun. 1970 7 p refs
(Contract AT(30-1)-3797)
(NYO-3797-10) Avail: NTIS

It was shown that an X-irradiated lambda phage could inject only a fragment of its DNA into bacteria. When lambda DNA was fragmented to low molecular weight and centrifuged, it was found that fragments from both the left and the right ends of the phage DNA were injected with equal frequency. It was found that replication of lambda DNA proceeded simultaneously to the left and right. Recombination studies showed that if the irradiation was carried out in the absence of oxygen there was a stimulation of recombination by X-radiation. Deoxyribonucleic acid was released from P labeled T7 phage and subjected to zonal centrifugation. It was shown that the terminal regions were very high in adenine and thymine. NSA

N71-14574# Argonne National Lab., Ill.
THE ARGONNE RADIUM STUDIES: COMPUTED RADIOBIOLOGICAL INDICES
Charles E. Miller, Asher J. Finkel, and Robert J. Hasterlik (Argonne Cancer Res. Hospital) Apr. 1969 110 p refs
(Contracts W-31-109-eng-38; AT(11-1)-2088)
(ANL-7680) Avail: NTIS

Data are tabulated on a number of radiobiological indices for 208 humans with a Ra burden acquired by ingestion during occupational exposure. Data are included on the exposure history of each person, radium body burdens as determined by whole-body counting, radiographic changes in bones attributed to radium, daily dose rate to the skeleton of each patient calculated in rads, and calculations of the radiation dose for a hypothetical patient who worked 30 days and contained 1 micro Ci of Ra on the 14,000th day following cessation of employment. Computer programs were used to compile the data. NSA

N71-14576# IIT Research Inst., Chicago, Ill.
EFFECTS OF CARBON MONOXIDE ON BRAIN CELLULAR METABOLISM IN MONKEYS Final Report, Nov. 1968 – Jun. 1969
Marilyn E. George, James P. F. Murphy, and Kenneth C. Back Wright-Patterson AFB, Ohio AMRL Aug. 1970 32 p refs

(Contract F33615-68-C-1270)
(AD-713609; AMRL-TR-70-88) Avail: NTIS CSCL 6/20

The toxicity of carbon monoxide has been extensively studied in many animal species and in man. The current interest is primarily concerned with air pollution and with establishing standards and controls for community and industrial atmospheric contamination. The effects of low level exposure to various air pollutants, including carbon monoxide, on the general population, i.e., people of all age groups in varying states of health and disease, are receiving wide attention. A study was undertaken to determine if continuous CO exposure would cause changes in brain tissue at the cellular and subcellular level in the absence of any overt clinical signs and to establish and measure any impairment in cellular respiration and high energy production. Relatively high concentrations of CO were used initially in an attempt to induce changes with succeeding exposures to be at lower concentrations. The two exposure concentrations of CO described in this paper were 220 mg/cu M and 440 mg/cu M in the atmosphere used for spacecraft, namely, 68% oxygen, 32% nitrogen at 5 psia. Author (TAB)

N71-14576# Army Behavior and Systems Research Lab., Arlington, Va.

HUMAN PERFORMANCE EXPERIMENTATION IN NIGHT OPERATIONS: TECHNOLOGY AND INSTRUMENTATION FOR FIELD RESEARCH. NIGHT OPERATIONS PROGRAM

Aaron Hyman, Jack J. Sternberg, and James H. Banks Jun. 1970 29 p refs
(AD-713463; BESRL-TRN-223) Avail: NTIS CSCL 5/5

The NIGHT OPERATIONS program is concerned with problems in optimizing human performance in relation to night vision devices and related sensors. The present publication provides a description and evaluation of the effectiveness of an instrumentation system developed under concepts provided by BESRL research scientists. The primary objective in this phase of the research was to develop an instrumentation system, embodying the requirements and essential characteristics for effective and accurate measurement of target detection and search behavior in field testing. Author (TAB)

N71-14609# RAND Corp., Santa Monica, Calif.

THE PUPIL: IMPORTANCE IN THE OPTICS OF THE VISUAL SYSTEM. PART 1: CLINICAL DATA

Hubert L. Moshin and Edward Goodlaw Oct. 1970 25 p refs Presented at the Meeting of the Am. Acad. of Optometry, Fla., Dec. 1970
(AD-713427; P-4469-Pt-1) Avail: NTIS CSCL 6/5

Closeup photographs were taken of each eye of 163 patients who had obtained and were wearing contact lenses. These photographs were taken in both an illuminated and a dark environment. Twenty-three variables were recorded and seven of these, relative to the pupil diameter, were analyzed. These data were then evaluated against the findings of other investigators. Author (TAB)

N71-14625# Joint Publications Research Service, Washington, D.C.

COORDINATION OF HUMAN VOLUNTARY MOVEMENTS IN SPACEFLIGHT

L. V. Chkheidze 2 Dec. 1970 127 p refs Transl. into ENGLISH of the publ. 'Koordinatsiya Proizvolnykh Dvizheniy Cheloveka v Usloviyakh Kosmicheskogo Poleta' Moscow, Sci. Publishing House, 1968 p 1–135
(JPRS-51899) Avail: NTIS

A detailed examination of the theoretical principles concerning the coordination of man's movements under normal conditions and when exposed to increased and reduced gravity fields is presented. Self-observations of cosmonauts on the stability of their motor skills during flight are also given, confirming the general conclusions drawn concerning the possibility of man retaining the coordination of movements during space flight in orbiting satellites. Author

N71-14632*# Israel Program for Scientific Translations, Ltd., Jerusalem.

BIOLOGICAL EFFECT OF MICROWAVES IN OCCUPATIONAL HYGIENE

Z. V. Gordon 1970 101 p refs Transl. into ENGLISH of the publ. 'Voprosy Gigieny Truda i Biologicheskogo Deistviya Elektromagnitnykh Poley Sverkhvysokikh Chastot Leningrad, Izd-Vo. Med., 1966 Supported by NASA and NSF
(NASA-TT-F-633; TT-70-50087) Copyright. Avail: NTIS CSCL 06I

Results of years of investigations in collaboration with laboratory personnel in the fields of occupational hygiene and biological effects of radio frequency electromagnetic irradiation are generalized for the range of superhigh frequencies (SHF). Emphasis has been placed on the occupational hygiene of personnel working with SHF sources and on protection against detrimental effects established by clinical and experimental investigations. A.L.

N71-14633*# University of Southern Calif., Los Angeles. Environmental Physiological Labs.

MONITORING CARDIOVASCULAR FUNCTION IN THE PRIMATE UNDER PROLONGED WEIGHTLESSNESS

John P. Meehan and Roland D. Rader [1970] 48 p refs
(Contract NAS2-2633)
(NASA-CR-73498) Avail: NTIS CSCL 06P

The Biosatellite 3 primate orbital mission was undertaken to determine the physiological effects of earth orbit on subhuman primates, to provide insights into possible hazards associated with long term space flights, and to acquire information on basic physiological adjustments to extended weightlessness. The design and construction of bioinstrumentation, ground conditioning experiments, and results of the flight tests are described. A.L.

N71-14641# School of Aerospace Medicine, Brooks AFB, Tex.

SOME EFFECTS OF D-AMPHETAMINE ON CARBOHYDRATE METABOLISM AT GROUND LEVEL AND ALTITUDE

Interim Report, Dec. 1969 – Mar. 1970
Patricia R. Korty Sep. 1970 10 p refs
(AD-713720; SAM-TR-70-62) Avail: NTIS CSCL 6/19

Measurement was made of blood glucose, liver glycogen, phosphorylase, and glucose-6-phosphatase in rats treated with d-amphetamine at ground level and at a simulated altitude of 8,000 ft. An increase in blood sugar levels was obtained in drug-treated animals in both environments. Altitude exposure per se also increased blood sugar levels, but the increase was not additive at altitude following drug treatment. Liver glucose-6-phosphatase activity was unaffected by drug or altitude exposure. Glycogen levels were lower in both amphetamine-treated groups, while phosphorylase activity was increased. The response of these two parameters was the same at ground level and at altitude. Author (TAB)

N71-14661# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

A COMPARISON OF VISUAL AND AUDITORY AUTOKINESIS

F. Ph. van Eyl and J. Th. Eernst [1970] 20 p refs
(IZF-1970-12; TDCK-55847) Avail: NTIS

The stationary visual stimulus was a 2-mm lightsource, the stationary auditory stimulus a 2000-Hz sine wave. Both stimuli were presented singly or simultaneously in a reverberation room and in an anechoic room. More visual than auditory movement was reported and statistical analysis of the Experiment 2 data showed

a significant interaction between mode of stimulus presentation and kind of environment: visual autokinesis was greater in the anechoic room, auditory autokinesis was greater in the reverberation room. The same interaction tendency was present in the Experiment 1 data but they did not reach statistical significance. It is suggested that the difference in extent of interaction was due to the fact that Ss were standing in Experiment 1 and seated in Experiment 2. The found autokinesis/environment interaction fits the frame-of-reference theory if it is assumed that spatial orientation (person-room relationship) was a variable. Auditory autokinesis can be attributed in part to response-bias behavior. Author

N71-14653*# Oakland Univ., Rochester, Mich. School of Engineering.

BIOSYSTEMS ENGINEERING RESEARCH. VOLUME 4: AUGMENTATION OF THE FOCUS CONTROL SYSTEM OF THE HUMAN EYE THROUGH INDEX OF REFRACTION VARIATION OF LIQUID CRYSTALS MATERIALS Final Report, 15 Mar. 1969–31 Jun. 1970

R. H. Edgerton Nov. 1970 49 p refs

(Grant NGR-23-054-003)

(NASA-CR-115864; TR-70-8) Avail: NTIS CSCL 06P

Research on the feasibility of developing a focus control device utilizing nematic liquid crystals is presented. Application to the development of a replacement for bifocal lenses is discussed. Experimental results obtained by applying a simple shear to nematic liquid crystals demonstrated that approximately a 5% change in index of refraction is realizable. A theoretical model to predict changes in the index of refraction assuming the crystals behave as ellipsoids when in a shear field is developed. This model is used in the geometrical design of the shear element. Author

N71-14666# Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies.

PHOTOCHEMISTRY AND ENZYMOLOGY OF PHOTOSYNTHESIS Technical Report, 1 May 1969–30 Jan. 1970

30 Jan. 1970 13 p refs

(Contract AT(30-1)-3706)

(RIAS-3706-15) Avail: NTIS

The concept of light conversion in photosynthesis reviewed is shown to have the electron transport chain driven by two linearly connected photosystems. Each photosystem consists of separate physical units, containing chlorophylls which funnel their absorbed energy into a trapping center. Each photosystem and the connecting ATP and ADP chain are described. Research given the most emphasis is outlined, and includes the cooperation of positive charges in oxygen evolution; pool sizes and kinetics of the interconnecting reaction chain; energy migration in the pigment bed; and role of manganese in oxygen evolution. N.E.N.

N71-14668# California Univ., San Francisco. Lab. of Radiobiology.

SIMILARITIES AND DIFFERENCES BETWEEN UV AND IONIZING RADIATION DEATH

Robert B. Painter [1970] 10 p refs Submitted for publication Supported by AEC

(UCSF-10-P-2-114; Conf-700810-6) Avail: NTIS

Comparisons of the effects of ultraviolet and X-radiation on mammalian cells are made using data from recent literature. Studies on survival levels and radioinduced damage to DNA of Chinese hamster cells indicated that ultraviolet radiation caused 1,000 times as much damage as X-rays. Studies on HeLa cells showed that although X - radiation caused mitotic delay, nearly every cell arrived at and completed the first mitosis; however, with uv, cell death often occurred during the first S phase after irradiation and many cells never arrived at mitosis. Mechanisms of repair of sublethal damage by mammalian cells are compared for uv and X-radiation. Repair of X-ray damage begins immediately, requires 1-1/2 to 2 hrs for maximum expression, and is relatively independent of cell cycle position. The action of uv, however, suggests that the main problem encountered by the cell is successful completion of DNA replication. NSA

N71-14673# Frankford Arsenal, Philadelphia, Pa.

RETINAL DAMAGE BY Q-SWITCHED RUBY LASER

Edwin S. Beatrice, M. B. Landers, J. O. Powell, and G. H. Bresnick 1970 15 p refs

(AD-713511) Avail: NTIS CSCL 6/5

In studies of retinal damage by the Q-switched ruby laser, threshold values were determined for both minimal and large retinal spot sizes. In addition to using the conventional ophthalmoscopic methods for detecting injury in the living animal, histopathological examinations were performed on a number of irradiated eyes following enucleation. The microscopic evaluation of irradiated tissue was considered to be particularly important in the minimal retinal spot size experiments in order to support the ophthalmoscopic observations of very small retinal lesions. In analyzing the data the macular and extramacular exposure sites have been considered separately because of conflicting reports concerning the relative sensitivity of these two retinal areas to laser damage. Author (TAB)

N71-14684# Brookhaven National Lab., Upton, N.Y.

EVALUATION OF POTENTIAL HAZARDS FROM TRITIUM WATER

V. P. Bond Jul. 1970 25 p refs Presented at the Symp. on Environ. Aspects of Nucl. Power Stations, New York, 10-14 Aug. 1970 Sponsored by AEC

(CONF-700810-6; SM-146/13) Avail: NTIS

The possible biological effects of tritium are analyzed, and several factors that must go into an evaluation are considered both from the theoretical and experimental standpoints. Maximum permissible concentrations or maximum permissible doses of tritium are based principally on the absorbed radiation dose delivered by the tritium beta rays. Several possible factors that might increase the degree of toxicity over that expected from the absorbed dose are considered in detail. These include the possibility of biological concentration of tritium, or of additional toxicity by virtue of the fact that some tritium may be incorporated into biological molecules such as DNA. The conclusion is reached that these factors do not significantly increase the effective dose that might be expected from a given concentration of tritium in the environment.

Author (NSA)

N71-14698# Oak Ridge National Lab., Tenn.

STUDY OF CHROMOSOMAL ABERRATIONS IN PERSONS EXPOSED TO REPEATED OCCUPATIONAL IRRADIATION

A. V. Sevan'kaev et al [1969] 5 p refs Transl. into ENGLISH from Genetika (USSR), v. 5, no. 7, 1969 p 126–128 Sponsored by AEC

(ORNL-tr-2332) Avail: NTIS

Chromosome aberrations were studied in a culture of peripheral blood leukocytes taken from 12 men subjected to repeated professional gamma irradiation during periods of time varying from 2 months to 4 years. The total cumulative doses received by these men during these periods varied from 0.02 to 2.08 R. The frequency of chromosomal aberrations in this group was shown to be 3 to 4 times as high as that in the control group consisting of 7 men of the same age. The frequency of aneuploid cells was also higher than in the control group. The determination of the chromosome aberrations in the cultures of peripheral blood leukocytes is recommended as a method of detection of the early symptoms of the effect on the organism of low radiation levels associated with the profession of the persons affected and with roentgeno-radiological medical procedures. Author (NSA)

N71-14702# School of Aerospace Medicine, Brooks AFB, Tex. Pharmacology-Biochemistry Branch.
DECREASED DIURESIS IN RESPONSE TO A THIAZIDE DIURETIC AT A SIMULATED ALTITUDE Interim Report, Jan.–Mar. 1970
Thomas S. Sulkowski and James H. Merritt Aug. 1970 12 p refs
(AD-713069; SAM-TR-70-48) Avail: NTIS CSCL 6/15

The effect of hydrochlorothiazide on the diuretic response of rats at 12,000 ft. was examined. After administration of a saline load, with and without drug, urine was collected over a 5-hr. period at both altitude and ground level. Total volume, urinary Na(+) and K(+), and pH were determined. The most pronounced effect of the altitude-drug interaction was decrease in the expected urine volume while the increased Na(+) output did not change from the observed with the drug at ground level. The results are discussed in relation to the possible basis for the observed phenomenon.
Author (TAB)

N71-14703# School of Aerospace Medicine, Brooks AFB, Tex. Neuropsychiatry Branch.
PERFORMANCE DECREMENT AS A FUNCTION OF SEVEN DAYS OF BEDREST Final Report, Oct.–Nov. 1969
Ralph W. Trimble and Charles S. Lessard Sep. 1970 11 p refs
(AD-713070; SAM-TR-70-58) Avail: NTIS CSCL 5/10

The hypothesis that performance decrements will occur as a function of 7 days of complete bedrest was tested in a study in which healthy, normal, young adult males served as subjects. Results indicate that longer periods of bedrest may be needed before any decrements become observable in this type of study.
Author (TAB)

N71-14706# Battelle-Northwest, Richland, Wash.
THE DOSE FROM Kr 85 RELEASED TO THE EARTH'S ATMOSPHERE
M. M. Hendrickson Jul. 1970 15 p refs Presented at the Symp. on Environ. Aspects of Nucl. Power Stations, New York Sponsored in part by AEC
(BNWL-SA-3233-A; CONF-700810-16; SM-146/12) Avail: NTIS

The total body exposure rate was calculated for immersion in Kr-85. The exposure from both gamma rays and from X-rays produced from bremsstrahlung was accounted for. Immersion exposure for one year to a semi-infinite cloud of Kr-85 with an activity concentration of 3 × 10 to the minus 6th power microcurie/cu cm would result in a calculated dose of 75 mrem. In numerous instances 1/10 the above concentration has been equated to a total body exposure rate of 500 mrem per year when in fact a continuous concentration of 3 × 10 to the minus 7th power microcurie/cu cm is calculated to give a total body exposure rate of 7.5 mrem per year. The reason for the numerous overestimates of the projected total body dose is traceable to use of the recommendations of the ICRP for immersion dose calculations. The ICRP-recommended method gives valid estimates of the dose for mixtures of inert gas isotopes which are primarily gamma emitters, not beta emmiters. The method also gives a valid estimate of the skin dose for beta emitters.
Author (NSA)

N71-14722# State Univ. of New York, Stony Brook. Div. of Biological Sciences.
BIOCHEMISTRY OF GROWTH, GAMETOGENESIS, AND FERTILIZATION IN ALGAE Comprehensive Report, Oct. 1967–Sep. 1970
Sep. 1970 38 p refs
(Contract AT(30-1)-3475)
(NYO-3475-24) Avail: NTIS

Research investigation indicates that the unicellular green alga chlamydomonas reinhardtii is a model system for the study of cell differentiation during growth, gametogenesis, and fertilization. Briefly reviewed are: the organism and its potential; synchronous growth and cell division; periodic enzyme activity; gametogenic differentiation; nucleic acid synthesis during vegetative growth and gametogenic differentiation; and, role of organelle and nuclear DNA in growth and development in Chlamydomonas.
A.L.

N71-14834# Technology, Inc., San Antonio, Tex. Life Sciences Div.
EVALUATION OF EYE HAZARDS FROM NUCLEAR DETONATIONS Final Report, 1 Aug. 1969–31 Aug. 1970
James A. Nickel Sep. 1970 62 p refs
(Contract F41609-69-C-0049)
(AD-713152) Avail: NTIS CSCL 6/21

The retinal exposure equation, from which safe separation distances were calculated, was used as a basis for developing a linearized equation. New scaling laws for the spectral power and fireball radiance were also developed. These equations were used in deriving a variance equation for the safe separation distance. This equation is expressed in terms of variances of the independent variables: retinal exposure, time of irradiation, yield, observer and burst altitude. The importance of retinal irradiance at the time of cutoff (as effected by blinking or introduction of other shielding) is demonstrated by an analysis of the coefficients in the variance equation, supported by a limited set of calculations. Retinal irradiance is affected by variations in the f-number of the eye and pulse profile of the fireball. The largest variances occur when the cutoff time is near a radiance maximum (approximately a thermal maximum). Small increases in the variance are realized with increased differences in the vertical separation of observer and fireball, but these appear to be of importance only with very low yield weapons.
Author (TAB)

N71-14817*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
A METHOD OF DESCRIBING THE SPONTANEOUS ACTIVITY OF NERVE UNITS THAT EXHIBIT A STOCHASTIC DEAD TIME
Michio Aoyagi Nov. 1970 20 p refs
(NASA-TM-X-62007) Avail: NTIS CSCL 06P

A method is presented for describing the statistical characteristics of the spontaneous electrical activity of nerve units that have stochastic dead times following an impulse. The method is based on the determination of the possible functional forms of the marginal cumulative distribution of the interspike times that result from a concept of the nerve unit behavior. For the purpose of illustration, the method is applied in the appendix to an observed series of electrical impulses originating spontaneously from an isolated vestibular nerve unit of the frog.
Author

N71-14891# Federal Aviation Administration, Oklahoma City, Okla. Office of Aviation Medicine.
AUDITORY PROCESSING FOR SPEECH INTELLIGIBILITY IMPROVEMENT
Jerry V. Tobias Apr. 1970 12 p refs
(FAA-AM-70-8) Avail: NTIS

The human auditory system, appropriately stimulated, is capable of creating the effect of an improved signal-to-noise ratio without actually changing either the signal or the noise intensities. Tests of these techniques show that their proper application to a loudspeaker-listening situation is equivalent to a 5-dB improvement in signal-to-noise ratio. Since the method is based in the human observer's signal-processing ability, it requires no special equipment in the aircraft. Two loudspeakers are used, driven from the same signal source, but with the two speakers wired in opposite phase to each other. Within broad limits, variations in speaker placement permit the improved results. These limits are defined.
Author

N71-14992# Joint Publications Research Service, Washington, D.C.
THIRD ALL-UNION CONFERENCE ON ENGINEERING PSYCHOLOGY
N. Mazok 16 Dec. 1970 10 p Transl. into ENGLISH from Sots. Trud (Moscow), No. 10, Oct. 1970 p 149–153 Conf. held at Kalinin, 7–11 Jul. 1970
(JPRS-52006) Avail: NTIS

The development of engineering psychology an an independent science is discussed. The topics discussed include systems engineering, the reliability and effectiveness of man-machine systems, reception and processing of information by the human operator, means of presenting information, modeling in engineering psychology, and methods of research and experiment planning. R.B.

N71-15481# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
SPARK CHAMBERS AND THEIR APPLICATIONS TO NUCLEAR MEDICINE [CHAMBRES A ETINCELLES ET APPLICATION A LA MEDECINE NUCLEARE]
Alain Lansiart 1970 19 p refs In FRENCH Presented at the 12th Meeting on Exploration Tech. Using Radioact. Isotopes, Strasbourg, 22–24 May 1970
(CEA-CONF-1578; CONF-700536-1) Avail: AEC Depository Libraries

The development of spark chambers is briefly reviewed, and their classification (operation by wall effects, gas particle interactions, three electrode chamber) and different recording techniques are discussed. An example is given of the excellent results obtained using the Kellershohm-Lansiart chamber for thyroid examination. Author (NSA)

N71-15494# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
DOSE DISTRIBUTION OF PRIMARY NEUTRON COLLISION IN TISSUE AS A FUNCTION OF LINEAR ENERGY TRANSFER [DISTRIBUTION DE LA DOSE DE PREMIERE COLLISION DES NEUTRONS DANS LES TISSUS EN FONCTION DU TRANSFERET D'ENERGIE LINEIQUE]
Marc H. Dousset, Jean Hamard, and Alain Ricourt [1970] 26 p refs In FRENCH; ENGLISH summary Presented at the 2d Intern. Radiation Protect. Assoc. Congr., Brighton, England, 3–8 May 1970
(CEA-Conf-1554; Conf-700505-12) Avail: AEC Depository Libraries

In order to contribute to the interpretation of the radiobiological data obtained when thin samples of tissue are exposed to neutrons, the first collision dose distribution as a function of LET was calculated for monoenergetic neutrons with energies between 0.025 eV and 10 MeV. From the results obtained the same distribution for neutrons with complex energy spectrum may be easily calculated. Author (NSA)

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N71-14601*# Research Triangle Inst., Durham, N.C.
APPLICATIONS OF AEROSPACE TECHNOLOGY IN BIOLOGY AND MEDICINE Semiannual Report, 15 Mar.–30 Sep. 1970
Sep. 1970 159 p refs
(Contract NASw-1950)
(NASA-CR-115888) Avail: NTIS CSCL 06B

The activities of a biomedical application team are presented. Subjects discussed are: (1) team composition and participating medical institutions, (2) summary and analysis of technology transfers, (3) summary and analysis of problems investigated by the biomedical application team, and (4) computer information searches. Author

N71-14602*# General Electric Co., Schenectady, N.Y. Research and Development Center.
APOLLO HELMET DOSIMETRY EXPERIMENTS Final Report
G. M. Comstock, R. L. Fleischer, and H. R. Hart, Jr. Nov. 1970 29 p refs
(Contract NAS9-9828)
(NASA-CR-114804) Avail: NTIS CSCL 06B

Recent reports by Apollo astronauts of lines of light apparently seen with the eyes closed have caused concern for the possible biological effects of heavily ionizing particles that penetrate the shielding of the spacecraft or space suit. A dosimetry experiment consists of using plastic Apollo helmets as recorders of heavy cosmic ray particles directly incident on the face and heads of the astronauts. Particle tracks are revealed by chemically etching the interior of the Lexan polycarbonrate helmet to produce cone-shaped holes, which are later counted. Author

N71-14665# Naval Postgraduate School, Monterey, Calif.
ACTIVITY LEVELS AND AIRCRAFT TYPES IN JET PROFICIENCY FLYING CRT AT NALF MONTEREY. DATA ACQUISITION AT FOUR HOURS PER MONTH IN THE T-1A AIRPLANE Interim Technical Report
David A. Schrady Sep. 1970 84 p refs
(AD-713115; NPS-55S00091A; ITR-1) Avail: NTIS CSCL 5/9

Methods were developed for the collection of data with respect to the knowledge, skill, and satisfaction of aviators in combat readiness training (CRT). The methods are described and data pertaining to aviators flying the T-1A aircraft at the rate of forty-eight hours per year is given. Author (TAB)

N71-14667# IIT Research Inst., Chicago, Ill.
CAPABILITIES IN MECHANICAL ENGINEERING
[1970] 18 p
Avail: NTIS

Aerospace research was achieved in the fields of crew restraint, life support, lunar surface exploration devices, and lunar shelter technology. Machine design for industry and government resulted in the development of totally new processes, high-speed assembly and packaging equipment, and unique approaches to mechanization. Current research has added knowledge to the phenomena of hypervelocity projection and impact, interior ballistics of unconventional launch systems, new methods of initiation of explosives, and space trajectory models. A space simulation laboratory permits the study of solar ultraviolet degradation, vacuum friction, sealing, lubrication, and cold welding while maintaining models under an ultrahigh vacuum. Author

N71-14683# Human Resources Research Organization, Alexandria, Va.
DEVICE-TASK FIDELITY AND TRANSFER OF TRAINING: AIRCRAFT COCKPIT PROCEDURES TRAINING
Wallace W. Prophet and H. Alton Boyd Jul. 1970 55 p refs
(Contract DAHC19-70-C-0012)
(AD-713433; HumRRO-TR-70-10) Avail: NTIS CSCL 5/9

The objective of the research was to evaluate the training effectiveness of two cockpit procedures training devices, differing greatly in their physical fidelity (and, consequently, cost), in the teaching of ground cockpit procedures for a twin-engine, turboprop,

fixed wing aircraft. One group of students received training in cockpit procedures in a relatively expensive, sophisticated, high-fidelity, computerized cockpit procedures trainer, while another group were trained in an inexpensive, low-fidelity mockup of the aircraft cockpit. Their subsequent performance in the actual aircraft was compared with that of a control group who received all of their procedures training in the aircraft. Results indicated that both training devices produced significant transfer of training, in terms of error and time reduction, in performance in the actual aircraft. There were no significant differences in training effectiveness of the two devices, in spite of their great differences in physical fidelity and cost. Implications for the design of procedures training devices and associated training programs are discussed. Author (TAB)

N71-14705# Battelle Memorial Inst., Columbus, Ohio.
LOW-PRESSURE COMPRESSED AIR BREATHING SYSTEMS STUDY. 2: MARK 5 HELMET VENTILATION STUDIES
Summary Technical Report, 1 Apr. – 1 Aug. 1970
Jerry A. Henkener 22 Sep. 1970 53 p refs
(Contract N00014-69-C-0352)
(AD-713395) Avail: NTIS CSCL 6/11

This report presents experimental results of a testing program for determining mixing effectiveness factors and required ventilation rates for U. S. Navy Mark V diving helmets. Based upon the experimental results and data the following are concluded: Previous ventilation calculations based on a mixing effectiveness factor of 1.0 were conservative; a data base was obtained to more accurately predict required ventilation rates for hard hat diving; The data base for the Mark V should prove to be a valuable tool for comparing the effectiveness of other ventilated helmets. Author (TAB)

N71-14741# Army Natick Labs., Mass.
MICROCLIMATE-CONTROLLED (THERMALIBRIUM) CLOTHING SYSTEMS FOR MILITARY APPLICATIONS
Leo A. Spano and Vincent D. Iacono [1970] 15 p
(AD-713581) Avail: NTIS CSCL 6/17

Contents: Design principles for microclimate-controlled protective clothing systems; Protective clothing system for explosive ordnance disposal; Air-conditioned clothing for Army aircrewmen; and Performance evaluation of air-conditioned clothing. TAB

N71-14742# Texas Christian Univ., Fort Worth. Inst. for the Study of Cognitive Systems.
PARAMETERS OF HUMAN PATTERN PERCEPTION
Semiannual Progress Report, 16 Mar. – 16 Sep. 1970
Selby H. Evans 16 Oct. 1970 31 p refs
(Contract DAAD05-68-C-0176; Proj. Themis)
(AD-713185; SAPR-6) Avail: NTIS CSCL 5/10

The report is the sixth semi-annual progress report on a research program an parameters of human pattern perception. Empirical developments during this period have included: The successful application of multivariate techniques to the study of feature selection, and further specification of the effects of knowledge of results and temporal context on pattern recognition performance. Methodological and empirical results from the laboratory have been extended to the areas of individual difference testing and discrimination of polygraph recordings. Author (TAB)

N71-14743# Illinois Univ., Urbana. Aviation Research Lab.
WHAT MOVES, THE AIRPLANE OR THE WORLD? A REVIEW OF THE MOTION RELATIONSHIP PROBLEM IN PRESENTING AIRCRAFT ATTITUDE AND GUIDANCE INFORMATION
Steven L. Johnson and Stanley N. Roscoe Jun. 1970 50 p refs
(Contract N00014-67-A-0305-0014)
(AD-713179; ONR-70-1) Avail: NTIS CSCL 1/4

Display motion relationships for attitude and steering indicators have always been controversial issues in flight display design. The questions involve whether the pilot thinks the aircraft is moving relative to the outside world or the outside world is moving relative to the airplane. The pertinent information, obtained through both experience and formal experimentation, is reviewed. An alternative to the standard forms of attitude presentation employs the frequency separation principle. The problems considered when doing experimental investigations on flight displays are subject pools, research environments, flight tasks, and performance measures. Research requirements necessary to solve the longstanding questions on display motion relationships are presented. Author (TAB)

N71-14832# Maryland Univ., College Park. Computer Science Center.
EDGE AND CURVE DETECTION FOR VISUAL SCENE ANALYSIS
Azriel Rosenfeld and Mark Thurston Aug. 1970 37 p refs
(Contract F19628-70-C-0208)
(AD-713159; AFCRL-70-0489; SR-1) Avail: NTIS CSCL 6/16

Simple sets of parallel operations are described which can be used to detect texture edges, spots and streaks in digitized pictures. By comparing the outputs of the operations corresponding to (e.g.) edges of different sizes, a composite output may be constructed in which edges between differently textured regions are detected, and isolated objects are also detected, but the objects composing the textures are ignored. Relationships between this class of picture processing operations and the Gestalt psychologists laws of pictorial pattern organization are discussed. Author (TAB)

N71-14833# Maryland Univ., College Park. Computer Science Center.
SHAPE SYNTHESIS, 1
Azriel Rosenfeld and Emily Johnston Sep. 1970 34 p refs
(Contract F19628-70-C-0208)
(AD-713163; CSC-TR-70-130; SR-2; AFCRL-70-0502) Avail: NTIS CSCL 6/4

The project is concerned with the computer synthesis of classes of natural shapes and patterns. The goal is to gain an understanding of the types of mathematical models that can be used to specify such classes. In this initial study, an approach based on medial axis transformations was used, and the synthesis of leaf shapes was taken as a test problem. A computer program was written to implement the chosen approach, and a mathematical model for this approach - in effect, a picture grammar for the leaf shapes - was formulated. Explicit use of coordinates appears to be desirable in grammars of this type. Author (TAB)

N71-14889*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE EFFECTS OF MOTION CUES AND MOTION SCALING ON ONE- AND TWO-AXIS COMPENSATORY CONTROL TASKS
Hugh P. Bergeron, James J. Adams, and George J. Hurt, Jr. Washington Jan. 1971 30 p refs
(NASA-TN-D-6110; L-7365) Avail: NTIS CSCL 06B

One- and two-axis compensatory control tasks were performed both with and without motion inputs. Additional tests were made in which the motion input, compared with the visual input, was reduced in scale. Little or no difference in error measurements was observed in the single-axis-motion/no-motion tests. However, a decrease in normalized tracking error and an increase in the closed-loop system frequency were observed when motion was added to the two-axis tests. In the tests with reduced motion scale, the normalized tracking error remained constant for full 1/2, and 1/4 motion scaling but increased with a further reduction in

motion scaling. In general, the results show that motion may or may not be an aid in controlling a compensatory tracking task, depending on the difficulty of the task and on the requirements of the mission. Also it is shown that for cases in which motion is beneficial, it is not always necessary to supply full-scale motion cues. Author

06 CHEMISTRY

Includes chemical analysis and identification (e.g., spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N71-14590# National Science Foundation, Washington, D.C.
HEAT OF FORMATION OF METAL SULFIDES AND THEIR STABILITY [TEPLOTA OBRAZOVANIYA I USTOICHIVOST SULFIDOV METALLOV]
V. A. Vanyukov et al 1970 46 p refs Transl. into ENGLISH from Inst. Tsvet. Metal., Krasnoyar. Sb. Nauchn. Statei (USSR), no. 7, 1939 p 304–326
(TT-70-57084) Avail: NTIS CSCL 07D

A method of direct determination of sulfides allowed the determination of the heat of formation of metal sulfides, which are found to be very close to the actual values. It was found that sulfides of all of the investigated metals were not stable and dissociated at temperatures used in the metallurgy of nonferrous metals. The rate of dissociation of sulfides is inversely related to the atomic weights of metals. The phenomenon of matte flotation during fusion of sulfide was analyzed. The melting point of sulfides given in the literature till now cannot be taken as the correct values since the dissociation of sulfur during fusion was not accounted for. USGRDR

N71-14603# Barkley and Dexter Labs., Inc., Fitchburg, Mass.
RESEARCH DIRECTED TOWARD THE EXPERIMENTAL INVESTIGATION OF METHODS OF ANALYZING SO2/SO3 RATIOS IN JET EXHAUSTS Final Report, 15 Aug. 1968–14 Aug. 1969
Lawrence R. Day, Edwin C. Dunton, Raymond B. Wilson, and Michael Zinchuk 6 May 1970 35 p
(Contract AF 19(628)-6137)
(AD-713222; AFCRL-70-0279) Avail: NTIS CSCL 7/4

Research was directed towards the analysis of SO2/SO3 ratios in jet exhausts at temperatures of 600C and Mach I gas streams. Spectral absorbance measuring techniques in the ultra violet region of the spectrum appeared to offer the best method of measurement. Equipment was designed and developed incorporating these techniques. Other aspects of jet exhausts were also investigated including contrail scattering and ionization effects. Equipment was also developed for the measurement of infrared radiation from a jet engine. Author (TAB)

N71-14621# Iowa State Univ. of Science and Technology, Ames.
NEODYMIUM-NEODYMIUM HYDRIDE PHASE SYSTEM
Thomas John Poskie (M.S. Thesis) May 1970 32 p refs
(Contract W-7405-eng-82)
(IS-T-416) Avail: NTIS

The neodymium-neodymium hydride phase system has been studied. Pure neodymium has a double hexagonal crystal structure at room temperature. It transforms to a body centered cubic structure at 857 and melts at 1018 C. The addition of hydrogen to neodymium produces two eutectoid reactions. The first of these occurs at 813 C and 12.5 at. % hydrogen. The second eutectoid reaction exists at 22.2 at. % hydrogen. The solubility of hydrogen in neodymium increases rapidly with temperature while the composition of the neodymium hydride phase changes very little with temperature. A previously unreported phase was found to exist above the eutectoid reaction at 872 C. This phase is an intermediate stable phase which exists between the double hexagonal and the body centered cubic phases at higher hydrogen contents. Author (NSA)

N71-14643# British Columbia Univ., Vancouver. Dept. of Chemistry.
CHEMICAL REACTIONS IN FROZEN SOLUTIONS Final Report, 1 Mar. 1966–30 Jun. 1970
Richard E. Pincock, Min-Min Tong, Wen Shu Lin, William Bruce Scott, and B. C. Menon 30 Jun. 1970 7 p refs
(Grants AF-AFOSR-1102-66; AF-AFOSR-1102-66A)
(AD-713623; AFOSR-70-2228TR) Avail: NTIS CSCL 7/4

A very brief summary is presented on a research effort to investigate the kinetics of some bimolecular reactions in frozen solutions. TAB

N71-14644# Aerojet-General Corp., Sacramento, Calif. Materials Research Lab.
PHASE EQUILIBRIA INVESTIGATION OF BINARY, TERNARY, AND HIGHER ORDER SYSTEMS PART 9: CALCULATION OF THERMODYNAMIC QUANTITIES FROM PHASE DIAGRAMS Technical Report, Apr. 1967–May 1969
Erwin Rudy Wright-Patterson AFB, Ohio AFML Aug. 1970 51 p refs
(Contract F33615-67-C-1513)
(AD-713712; AFML-TR-69-117-Pt-9) Avail: NTIS CSCL 7/4

The thermodynamic fundamentals relating phase equilibria in binary and ternary systems to the thermodynamic properties of the phases are reviewed and discussed. Considered in detail are partition equilibria in ternary systems and the role of the three-phase equilibrium in the determination of the relative stabilities of stable as well as hypothetical phases. Sample calculations carried out on selected ternary metal-carbon and a metal silicate system demonstrate the application of the equations for extracting thermodynamic data from phase diagrams and also for the prediction of phase equilibria. Author (TAB)

N71-14645# Military Academy, West Point, N.Y.
PHASE BEHAVIOR IN FLUID MIXTURES AT HIGH PRESSURES. 1: EXPERIMENTAL
James L. E. Hill and William B. Streett 1970 14 p refs
(AD-713540) Avail: NTIS CSCL 7/4

The work reported here represents part of a long-term research objective of determining accurate experimental liquid-vapor phase equilibrium data on binary fluid mixtures in the temperature range 13-160 Kelvin and at pressures up to 4000 atm. Systems under investigation are those in which, under these conditions, one component is normally a gas and the other is a liquid. These substances are among those with the lowest critical temperatures and the simplest molecular structures. The gas-liquid critical curve extending into pressure-temperature-composition (PTX) space, from the critical point of argon, has been well-defined by eleven experimental points. It was found to pass through a minimum in temperature at 147.1K, and a pressure of 440 atm. These results confirm the presence of fluid-fluid equilibrium in this system at temperatures above the critical temperature of argon (150.86K). Additionally, the three phase boundary solid-liquid-gas (solid-fluid-fluid) has been determined at pressures to 4000 atm. Author (TAB)

N71-14699# Dow Chemical Co., Golden, Colo. Rocky Flats Div.
GENERALIZED AREA OF INTERSECTION MODEL FOR URANYL NITRATE FILLED PIPE INTERSECTIONS

Deanne Dickinson and C. L. Schuske 4 Sep. 1970 15 p refs
(Contract AT(29-1)-1106)
(RFP-1553) Avail: NTIS

An empirical model is presented for calculating safe nuclear criticality parameters for complex arrays of intersecting pipes containing enriched uranyl nitrate solution. The current model, an extension of one presented in a previous report, is derived from Monte Carlo calculations as well as from experimental data. Author (NSA)

N71-14707# Bhabha Atomic Research Centre, Bombay (India).
DETERMINATION OF RARE EARTH IMPURITIES IN PURIFIED LANTHANUM OXIDE USING THE STALWOOD JET
S. V. Grampurhoit and V. P. Bellary 1970 8 p refs
(BARC-472) Avail: AEC Depository Libraries

A dc arc method is described for the estimation of Ce, Pr, and Nd in purified lanthanum oxide. The spectra are excited at 8.0 A by means of a Stallwood jet with oxygen atmosphere and recorded in the second order of a 1200 grooves/mm grating on a 3.4-meter Jarrell Ash grating spectrograph. The detection limits attained are 0.003% for Ce, 0.002% for Pr, and 0.001% for Nd. Author (NSA)

N71-14708# Bhabha Atomic Research Centre, Bombay (India).
SPECTROGRAPHIC DETERMINATION OF RARE EARTH IMPURITIES IN ERBIUM OXIDE AND YTTERBIUM OXIDE
S. V. Grampurohit and K. Swamy 1970 11 p refs
(BARC-471) Avail: AEC Depository Libraries

A spectrographic method is described for the estimation of dysprosium, holmium, thulium, and ytterbium in pure erbium oxide and lutetium, erbium, and thulium in pure ytterbium oxide. A Jarrell Ash grating spectrograph and a dc arc excitation method are employed for the estimation of the impurities in the following concentration ranges: Dy 0.005 to 0.5%, Tm, 0.005 to 0.5%, Ho 0.025 to 0.5%, and Yb 0.0025 to 0.5% in Er_2O_3; and Er 0.005 to 0.05%, Tm 0.005 to 0.1%, and Lu 0.035 to 0.5% in Yb_2O_3. Author (NSA)

N71-14709# Bhabha Atomic Research Centre, Bombay (India).
A SPECTROGRAPHIC METHOD FOR THE DETERMINATION OF EUROPIUM AND YTTRIUM IN RARE EARTH MIXTURES
S. V. Grampurohit and R. K. Bagal 1970 10 p refs
(BARC-470) Avail: AEC Depository Libraries

A dc arc method is described for the estimation of europium and yttrium in rare earth mixtures. The sample is diluted with cerium oxide, zinc oxide, and graphite in the ratio 1:1:4:4 and 15 mgs of this mixture is taken in the cavity of a 1/4-in. graphite electrode and arced at 6 amps. Using a large quartz spectrograph, the spectra are recorded in the region 2300 to 3300 A. Cerium is used as internal standard, and the intensity ratios of Y 2422.2 A/Ce 2464.36 A and Eu 2638.76 A/Ce 2651.01 A are measured. The ranges of concentration covered are 0.05 to 2% for europium and 1 to 50% for yttrium. Author (NSA)

N71-14710# British Steel Corp., London (England).
AUTOMATIC COLORIMETRIC DETERMINATION OF NITROGEN IN LOW WEIGHT STEEL SAMPLES
R. Willis [1970] 4 p refs
(SNW(C)V11/3) Avail: NTIS

The Technicon Auto Analyser has been applied to the determination of nitrogen in steel. The repeatability of the original manual procedure has been maintained, but the analysis time has been reduced and productivity increased. The Auto Analyser was applied to the analysis of routine samples for nitrogen for a period of five months. During the period, some hundreds of samples with nitrogen contents from 0.0010 to 0.013% were analysed, in duplicate. The repeatability calculated from the duplicate results was + or − 0.0002% (95% confidence limits) which was similar to that obtained by the manual method and better than obtained by the British Standard method B.S. 1121 Part 38 (95% confidence limits + or − 0.0005% N). Author

N71-14728# Food and Drug Administration, Washington, D.C.
INTERBUREAU BY-LINES, VOLUME 6, NO. 5, CONSECUTIVE NO. 35, MARCH 1970
Mar. 1970 57 p refs
(PB-190961) Avail: NTIS CSCL 06O

Selected articles are presented on determination of fluorides in solder fluxes using the specific fluoride electrode, bibliography of microbial contamination, characterization and determination of an impurity found in 'distilled-in-glass' acetonitrile by NMR and mass spectrometry, spectrofluorometric and TLC determination of quinidine sulfate contamination in various drugs, thirty-nine years of change as seen from within the FDA, applications of NMR spectroscopy to regulatory drug analysis, rapid assay of selected compounds by internal standard procedures, and a bibliography on quaternary ammonium compounds in foods. USGRDR

N71-14744*# Colorado Univ., Boulder. Lab for Atmospheric and Space Physics.
ROCKETBORNE ULTRAVIOLET SPECTROMETER MEASUREMENT OF OH RESONANCE FLUORESCENCE WITH A DIFFUSIVE TRANSPORT MODEL FOR MESOSPHERIC PHOTOCHEMISTRY
James G. Anderson [1970] 80 p refs
(Grant NGL-06-003-064)
(NASA-CR-115883) Avail: NTIS CSCL 07D

An upper limit on the column density of the hydroxyl radical in the earth's upper atmosphere was determined with a rocket-borne scanning spectrometer using resonance fluroescence techniques in the near ultraviolet. Particular attention was given to the problem of determining the Rayleigh scattered background to allow accurate determination of of the column emission rate from the OH molecule. An emission rate factor calculation for OH is presented which considers the rotational structure of the molecule and the effect of absorption of OH in the solar atmosphere. Author

N71-14777# Nolit Publishing House, Belgrade (Yugoslavia).
BULLETIN OF THE CHEMICAL SOCIETY, BELGRADE, VOLUME 33, NO. 5–7, 1968
1970 120 p refs Transl. into ENGLISH of Glasnik Hem. Drustva, Beograd (Belgrade), v. 33, no. 5-7, 1968 Supported by Dept. of Com. and NSF
(TT-68-50058/5-7) Avail: NTIS CSCL 07D

Contents: a study of invertase from a thermotolerant strain of saccharomyces cerevisiae; polarographic determination of lead in the presence of tin; polarographic determination of copper in the presence of cadmium and zinc; the mechanism of formation of new phases in the silicon-manganese system; influence of direct current and of the composition of the titrated solution on the accuracy; effect of successive hyperinsulinemias on rat liver glycogen level; influence of activator concentration on the fluorescent properties of AgCl(Mn + +) single crystals; kinetics of formation of new phases in the systems silicium-manganese; ultraviolet spectra of some organophosphorous insecticides in different solvents; and frames of reference in the study of diffusion in binary systems. USGRDR

N71-14821# Eidgenoessische Technische Hochschule, Zurich (Switzerland).

ON DIMENSIONAL ANALYSES FOR CATALYTIC SOLID BED REACTORS [ZUR DIMENSIONIERUNG KATALYTISCHER FESTBETTREAKTOREN]
Massimo Sgarlata Lattmann (Ph.D. Thesis) 1969 108 p refs In GERMAN
(Diss-4302) Avail: NTIS

Described is a dimensional optimization method for reactor geometries that considers operational parameters as well as their operational criteria. Developed is a two-dimensional continuum model calculating a nonisothermal solid state ractor from laboratory measurements of activation energies that considers the errors contained in model reactor equations. Transl. by G.G.

N71-14904# Dayton Univ. Research Inst., Ohio.
BONDING AND CHEMICAL COMBINATION STUDIES USING THE ELECTRON MICROBEAM PROBE Technical Report, Oct. 1969 – Feb. 1970
William L. Baun (AFML, Wright-Patterson AFB, Ohio) and James S. Solomon Wright-Patterson AFB, Ohio AFML Aug. 1970 38 p refs Presented at the 21st Pittsburgh Conf. on Anal. Chem. and Appl. Spectry., Cleveland, 3 Mar. 1970
(Contract F33615-69-C-1330)
(AD-713711; AFML-TR-70-80) Avail: NTIS CSCL 14/2

The changes in x-ray emission spectra due to chemical combination may be used effectively with the electron microbeam probe to quickly identify compounds and alloy phases. To lessen the tedium of measuring small spectral changes and to improve precision, step scanning, and automatic data acquisition and handling techniques are used. Such a system is described and computer plotted spectra from hypervelocity impact specimens, oxidation specimens, and thin films are shown. Difficulties and limitations of the technique are discussed, such as carbon contamination and the changes in some spectra due to electron beam penetration changes which influence self-absorption. The self-absorption phenomenon may be taken advantage of, however, and it is shown that the computer can prepare self-absorption plots which closely approximate true absorption spectra. Author (TAB)

N71-14967*# Chicago Univ., Ill. Enrico Fermi Inst.
ABSOLUTE SCALE FOR RADIATION AGES OF STONY METEORITES
G. F. Herzog and Edward Anders [1970] 16 p refs
(Grant NGL-14-001-101; Contract AT(11-1)-382)
(NASA-CR-115884; EFI-70-62) Avail: NTIS CSCL 07D

Absolute production rates of He-3 and Ne-21 in L-chondrites have been determined from a least-squares fit of noble-gas to Al-26 data, for meteorites of radiation age <2 Myr. in which Al-26 has not been built up to saturation levels. The values obtained, 2.48 + or − 0.23 and 0.466 + or − 0.31 ccSTP G(−1) Myr(−1), are 24% higher than conventional values, based on He-3 measurements. This would indicate that all published radiation ages of stony meteorites based on conventional production rates are too high by 24%. Author

N71-14985# Joint Publications Research Service, Washington, D.C.
THE CHEMISTRY OF MODIFIED WATER
B. W. Deryagin et al 11 Jan. 1971 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v.195, no. 2, 1970 p 398–401
(JPRS-52136) Avail: NTIS

Modified water (MW) represents a solution of a certain anamolous component with a molecular weight of approximately 180 in ordinary water. Spectrochemical analysis of MW and investigations of its surface tension and thermal stability have confirmed the hypothesis that the effect of modification is not connected with the presence of impurities and is explained by the formation of resistant polymeric molecules of water. The latter form as a result of catalytic polymerization of saturated vapors on the surface of glass or quartz. The physical and chemical properties of MW are presented. Author

N71-14986# TRW Systems Group, Redondo Beach, Calif.
STUDY OF ADVANCED BLADDER TECHNOLOGY, OF2 DIBORANE Final Report, 2 Sep. 1969 – 1 Jul. 1970
J. W. Martin, J. F. Jones, and J. A. Neff 1 Jul. 1970 52 p refs Prepared for JPL
(Contract NAS7-770)
(NASA-CR-115902; TRW-14231-6011-R0-00) Avail: NTIS CSCL 11J

The development and characterization of elastomeric materials suitable for use as positive expulsion bladders for the space storable propellants oxygen difluoride and diborane is discussed. The mechanical properties (tensile strength and elongation at break) are described. The results of long term compatibility tests are presented. Author

N71-15447# British Steel Corp., London (England). Metallurgy Div.
THE CONTINUAL MONITORING OF SINTER MIXTURES Progress Report, Apr. 1967
G. White, P. Barker, G. R. Oliver, and K. G. Ridgeway 1970 15 p refs Supersedes MG/D/534/67
(MG/D/589/68; MG/D/534/67) Avail: NTIS

A radioisotope analytical scheme suitable for the determination of the major constituents of sinter mixtures was developed and the precision of the technique when used with automatic sample presentation was established. The equipment was used in conjunction with a sampling and sample preparation scheme and the performance under plant conditions was critically examined. Results were sufficiently encouraging to suggest the construction of a second fully automatic system. Author

N71-15489# California Univ., Los Angeles. Dept. of Chemistry.
MECHANISM OF ADDITION OF SINGLET OXYGEN TO OLEFINS
Christopher S. Foote [1970] 19 p refs Reprinted Plenary Lecture presented at Munich, 1970
(Grants NSF GP-5835; NSF GP-8293)
Avail: Issuing Activity

Mechanisms of addition of singlet oxygen to various classes of substrates are surveyed. The experimental data for the allylic hydroperoxidation are best fit by a concerted, one-type mechanism; the addition to dienes is probably a Diels-Alder reaction. 1,2-Cyclo-additions to electron-rich olefins may proceed by a 1,4-dipolar mechanism, although there is as yet little evidence, while the addition to sulfides may go by a very similar nucleophilic addition to oxygen. Author

N71-15492# Research Inst. of National Defence, Stockholm (Sweden).
SPECTROCHEMICAL DETERMINATION OF TRACES OF IMPURITY ELEMENTS IN PLUTONIUM BY THE COPPER SPARK METHOD: PRECISION AND LIMITATIONS
Lars-Henrik Andersson, Ingegaerd Johansson, and Rune Soederlund Oct. 1970 9 p refs *Its* FOA Vol. 4, No. 8
(FOA-4-B-4042-24) Avail: NTIS

The copper spark method has been used for the spectrochemical determination of impurity elements in samples containing plutonium. The instrumentation, equipment and procedure

used in these determinations are described. Blank values for the whole procedure have been determined as a matter of routine, and steps taken to reduce their size are described. The precision and limits of detection of the method in quantitative determination of several trace elements have been evaluated. Large amounts of impurities and ion-exchange decomposition products in the sample solution result in decreased precision and high limits of detection. Author

N71-15493# Research Inst. of National Defence, Stockholm (Sweden).

A STUDY OF THE PRECISE DETERMINATION OF MACROAMOUNTS OF PLUTONIUM IN SOLUTION BY THREE ELECTROMETRIC OXIDATION-REDUCTION TITRATION METHODS

Lars-Henrik Andersson, Eva-Britt Bauren, and Eyvind Helleday Oct. 1970 9 p refs *Its* FOA Vol. 4, No. 7
(FOA-4-B-4041-24) Avail: NTIS

The precise determination of macroamounts of plutonium in solution has been studied by two potentiometric and one amperometric titration method. The potentiometric methods were, within the limits of experimental error, without bias, but the results obtained with the amperometric method were too high. When the amperometric method and one of the potentiometric methods were applied to the titration of dichromate solutions, a systematic difference was again found, the amperometric method giving low values. The discrepancies mentioned may be explained by assuming that small amounts of hydrogen peroxide are formed at the anode during the amperometric titration. For samples containing 20–30 mg of plutonium the precision of the two potentiometric methods in routine duplicate determinations was of the order of 0.1 per cent or slightly better. The influence of americium has been studied, but no definite conclusions can be drawn from the results obtained. Author

N71-15526# Research Inst. of National Defence, Stockholm (Sweden).

IR DETECTOR WITH 13 Ge - Hg ELEMENTS [IR-DETEKTOR MED 13 ST GE - HG ELEMENT]

Hans Ekblom Aug. 1969 14 p refs In SWEDISH
Avail: NTIS

The construction and assembly of an IR detector with 13 Ge - Hg elements is described. The sensitive surface of 8 of the elements is 0.2 × 0.3 sq mm and 0.3 × 0.3 sq mm for the remainder. The relative separation is 0.15 mm. The detection characteristics of the elements were measured with the detectors mounted in the freezing machine Cryomite Mark 7C. Typical graphs of the signal and noise dependency on voltage are given. Author

N71-15693# California Univ., Livermore. Lawrence Radiation Lab.

RARE EARTH CHELATES. 3: THE EMISSION SPECTRUM OF EUROPIUM TRIS-2,2,6,6-TETRAMETHYL-3,5 HEPTANEDIONE

David H. Sisson and V. Alan Mode [1970]18 p Presented at the 25th Symp. on Mol. Struct. and Spectry., Columbus, Ohio, Sep. 1970 Sponsored by AEC
(UCRL-72707; CONF-700913-1) Avail: NTIS

The emission spectrum of Eu(thd)3 in the solid state and in alcoholic solutions over a temperature range of 77-300 K was obtained. The solid state spectrum analysis indicated a metal ion site symmetry of D3. In alcoholic solutions, two molecules of solvent were added to the coordination shell of the metal, and the metal site symmetry was changed to D2d or S4. Various analyses of tris- and tetrakis complexes were compared. Author

N71-15695# National Bureau of Standards, Inst. for Materials Research.

SEPARATION AND PURIFICATION SECTION: SUMMARY OF ACTIVITIES, JULY 1969–JUNE 1970

David H. Freeman and Walter L. Zielinski, Jr., eds. Jan. 1971 87 p refs
(NBS-TN-549) Avail: SOD $0.75

Studies on the properties of ion exchange microbeads are extended into the effects of humidity on bead volume, thermal effects on bead stability, and measurements of ion exchanger capacities. Preliminary investigations are completed for the quantitative infrared measurement of crosslinking in poly (styrene/divinylbenzene) copolymers. Progress is reported in the development and understanding of analytical liquid chromatography with an increased direction toward gel chromatography. The selection of apparatus components, their performance, and their application to examination of bilirubin, is described. Particle contaminations in inorganic salts and in container walls are examined. Author

N71-15696# National Bureau of Standards, Washington, D.C. Microchemical Analysis Section.

MICROCHEMICAL ANALYSIS SECTION: SUMMARY OF ACTIVITIES, JULY 1969 TO JUNE 1970

John K. Taylor, ed. Dec. 1970 128 p refs
(NBS-TN-545) Avail: SOD $1.25

Activities are reviewed in areas of gas analysis polarography, chemical microscopy, and classical microchemical analysis. Research activities described in some detail include: (1) preparation and analysis of carbon monoxide mixture for standard reference materials; (2) evaluation of sulfur dioxide permeation tubes as analytical standards; (3) polarographic methods for determination of trace elements in a number of materials; and (4) certification of urea as a microchemical standard. A chapter reviewing the state-of-the art of analysis for air pollutants is also included. Author

N71-15813# Royal Aircraft Establishment, Farnborough (England).

THE CONFIRMATION OF CHAIN STRUCTURE OF POLYNUCLEAR COMPOUNDS FORMED FROM PION-CRESOL AND FORMALDEHYDE. PART 1: BY VARIOUS SYNTHESES AND IDENTIFICATION OF THE REACTION PRODUCTS [DER NACHWEIS DER KETTENSTRUKTUR VON AUS PION-KRESOL UND FORMALDEHYD AUFGEBAUTEN MEHRKERNVERBINDUNGEN. 1: DURCH VERSCHIEDENE SYNTHESE UND IDENTIFIZIERUNG DER REAKTIONSPRODUKTE]

H. Kaemmerer Sep. 1970 25 p refs Transl. into ENGLISH from Makromol. Chem. (Basel), no. 56, 1962 p 123–137
(RAE-Lib-Trans-1486) Avail: NTIS

By means of rational, multiple syntheses, homologous polynuclear compounds were prepared consisting of p-cresol units linked by methylene bridges. The different ways of syntheses led to identical compounds. The chain structure can be confirmed by chain analog dehalogenation, by suitable condensations, and by the appropriate substitution bands in the infrared spectra of the compounds. Author

N71-15887# Technische Hogeschool, Eindhoven (Netherlands).

THE COPOLYMERIZATION OF ETHYLENE AND VINYLACETATE AT LOW PRESSURE: DETERMINATION OF THE KINETICS BY SEQUENTIAL SAMPLING

Anton Leendert German (Ph.D. Thesis) 1 Dec. 1970 112 p refs
Avail: NTIS

A study was conducted of copolymerization reactions dealing with gaseous and/or liquid monomers under pressure. Reported

results include the following: (1) A new and generally applicable experimental method was developed for pressures from atmospheric to 40 kgf/sq cm which permits a more accurate and justified determination of the monomer reactivity ratios than the more commonly used methods. (2) The method involves frequent sampling from the reactor and subsequent compositional analysis of the reaction mixtures by means of quantitative gas-liquid chromatography. (3) The method was applied successfully in the copolymerization reaction of ethylene with vinylacetate in the liquid phase at 62 C and 35 kgf/sq cm. (4) A study of the phase behavior indicates that under the conditions mentioned the reaction mixture is a homogenous single phase system. (5) The monomer reactivity ratios were determined by computational procedures based on non-linear least-squares methods. D.L.G.

07 COMMUNICATIONS

Includes communications equipment and techniques, noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N71-14510# Army Foreign Science and Technology Center, Washington, D.C.

STUDY OF FREQUENCY-SCANNING ARRAY OF RADIATORS ON CONVEX CURVE

R. A. Granovskaya 1 Sep. 1970 16 p Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Radioelektron. (USSR), v. 11, no. 5, 1968 p 452–459

(AD-713471; FSTC-HT-23-268-70) Avail: NTIS CSCL 9/5

Problems of realizing a convex slotted-guide array of radiators with frequency scanning are examined. Results of calculations of the required parameters of the radiator array are set forth for a number of specific cases along with experimental results of a study of a convex array of radiators designed on the basis of calculation results. Author (TAB)

N71-14647*# Ohio State Univ., Columbus. ElectroScience Lab.

A STUDY OF HIGH PERFORMANCE ANTENNA SYSTEMS FOR DEEP SPACE COMMUNICATION, Status Report, 15 Dec. 1969–15 Jul. 1970

Aug. 1970 75 p refs

(Grant NGL-36-008-138)

(NASA-CR-115865; Rept-2902-2) Avail: NTIS CSCL 09E

Recently defined parameters for a high data rate communication system which can operate between an earth station and a vehicle in space over great distances have been studied. An effort has been made to describe and delineate the characteristics of radiating subsystems and their internal subdivisions which can satisfy the requisite performance criteria for an S-band system. Considerations are given to the advanced technology concerned with the ground based antenna, and where pertinent, to the spacecraft antenna as well. Design approaches for the ground antennas and its component parts have been determined, and the appropriate design criteria investigated analytically, and where possible a comparison is made with empirically determined results in an effort to define areas of research and development which need long term attention. Author

N71-14648# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

SPEECH ANALYSIS AND RECOGNITION

L. C. W. Pols [1970] 28 p refs Presented at the IEEE Symp. on Feature Extraction and Selection in Pattern Recognition, Argonne, Ill., 5–7 Oct. 1970

(IZF-1970-16) Avail: NTIS

An on-line speech analysis system is described, using a set of 1/3-octave filters between 100 and 8000 Hz. After logarithmic amplification and envelope peak detection the 17 parallel filter outputs are sampled every 15 msec. A word is then characterized as a succession of sample points in a multidimensional space. A data reduction of the spectral 17 dimensional information to 3 main dimensions appears to be possible. An on-line word recognition system is developed which compares, after time normalization, the 3-dimensional traces of the spoken words with 20 reference traces representing a set of 20 possible utterances (10 digits plus 10 computer commands). For 20 speakers the correct score was 98.5%, using only the spectral information. A preliminary description of a phoneme recognition system is given, using a word segmentation procedure which is also based on the position of successive speech samples in the spectral space, plus some information about the time structure of the speech waveform. Author

N71-14726*# Collins Radio Co., Cedar Rapids, Iowa.

PRELIMINARY SPECIFICATION FOR THE LUNAR SOUNDER ANTENNA ASSEMBLY

11 Dec. 1970 14 p refs

(Contract NAS9-11348)

(NASA-CR-114797) Avail: NTIS CSCL 09E

This specification covers one type of equipment designated as Lunar Sounder Antenna Assembly. In conjunction with the Lunar Sounder HF Transmitter-Receiver and the Lunar Sounder Timer, the equipment provides for the radiation of energy to the lunar surface from an orbiting vehicle and provides the aperture for the reception of the reflected energy. See also N71-14727. Author

N71-14727*# Collins Radio Co., Cedar Rapids, Iowa.

HF SOUNDER STUDY Final Report, 16 Oct–18 Dec. 1970

18 Dec. 1970 87 p

(Contract NAS1-11348)

(NASA-CR-114795) Avail: NTIS CSCL 17B

The basic objectives of the study were as follows: (1) to determine the modifications required to operate the HF transmitter in a pulse mode with 10 microsecond pulse widths, (2) to determine the modifications required to change the operating frequency from the present 10.006 MHz to 5 MHz and to 15 MHz, (3) to determine the modifications necessary to provide a receiver bandwidth of 100 kHz or greater, (4) to determine the feasibility of increasing the transmit power level above the present 20 watts peak pulse power, (5) to provide an antenna concept and investigate the transceiver and antenna interface, (6) evaluate the equipment modifications necessary to permit operation in the environment specified, and (7) develop interface control documentation. The above objectives were modified to investigate frequencies of 2 MHz and 6 MHz rather than 5 MHz and 15 MHz. At a later date, the frequencies were again changed back to 5 MHz and 15 MHz. See also N71-14726. Author

N71-14738*# Stanford Research Inst., Menlo Park, Calif.

AN EXPERIMENTAL INVESTIGATION OF THE INTERACTION OF PLASMAS WITH ANTENNAS

W. C. Taylor Washington NASA Dec. 1970 63 p refs

(Contract NAS1-8889)

(NASA-CR-1727; Rept-7729) Avail: NTIS CSCL 17B

A program of measurements is reported related to two phenomena of plasma/antenna interaction. The major portion of the program consisted of measurement of admittance of three antennas exposed to the plasma of the SRI 12-inch shock tube. These three antennas are part of the plasma diagnostic flight instrumentation of the Reentry Attenuation Measurements program (RAM) of NASA's Langley Research Center. Most of the measurements were made at a single pressure level (0.1 torr initial

tube pressure), but over a wide range of electron density (10 to the 10th power to 10 to the 13th power el/cu cm). The results are compared with theoretical predictions. In the other portion of the program, an exploratory experiment was performed to investigate techniques for measuring the effects of local injection of electrophilic chemicals. Sulfur hexafluoride was injected into the shock-tube flow upstream of both an X-band slot antenna and electrostatic wire probes. The effects of the injected chemical were measured with respect to both antenna breakdown thresholds and thermal ionization levels. The injection rates and microwave power were varied from shot to shot, and the results are compared with shots without injection. Author

N71-14736# Weapons Research Establishment, Salisbury (Australia).
A NEW ANALYSIS OF THE SANDWICH WIRE ANTENNA
J. L. Whitrow and H. E. Green Mar. 1970 21 p refs
(ED-188) Avail: NTIS

It is hypothesized that the exact shape of the center conductor of a sandwich wire antenna, provided that it is of fairly simple form, is not first order effective in determining the radiating properties of the antenna. An analysis is therefore made by standard principles of a sandwich wire antenna having a particularly simple shape for the center conductor. Viewed as a travelling wave antenna, this approach leads to an explicit formula for the structure attenuation constant in terms of its geometrical parameters which may be used for design purposes. Experimental measurements are described which support the theory and also justify the shape independence hypothesis. Author

N71-14738*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MILLIMETER-WAVE PROPAGATION EXPERIMENTS UTILIZING THE ATS-5 SATELLITE Papers from the Fall 1970 Ursi Meeting
Louis J. Ippolito, comp. Nov. 1970 124 p refs Conf. held in Columbus, Ohio
(NASA-TM-X-65404; X-751; 70-428) Avail: NTIS CSCL 17B

A Millimeter Wave Propagation Experiment was launched aboard the Applications Technology Satellite (ATS-5), on August 12, 1969, and is providing the first propagation measurements from an orbiting satellite in the Ku (12.5 to 18 GHz) and Ka (25.5 to 40 GHz) frequency bands. The prime objective of this experiment is to provide sufficient information on the propagation characteristics of the earth's atmosphere so that this relatively unexplored and unused portion of the electromagnetic spectrum can be most effectively utilized for communications and data handling applications. The ATS-5 Millimeter Wave Experiment is providing amplitude and phase measurements on two independent test links at 15.3 GHz (satellite-to-earth) and at 31.65 GHz (earth-to-satellite) during measured and defined meteorological conditions. Several stations in the continental U.S. and Canada have been operating with the satellite transmission since October 1969. The overall experiment configuration and present data results from the first 10 months of measurements are briefly described. Author

N71-14745# Rome Air Development Center, Griffiss AFB, N.Y.
A NEW SATELLITE MULTIPLE ACCESS TECHNIQUE
John J. Patti (M.S. Thesis) Sep. 1970 169 p refs
(AD-713674; RADC-TR-70-167) Avail: NTIS CSCL 17/2

The Second Order Coherent Multiple Access (SOCMA) technique is proposed to satisfy the simultaneous demands of a large group of communications satellite users. The three basic satellite multiple access techniques, time, frequency, and code division techniques, are briefly reviewed. The performance of SOCMA is evaluated and compared to that of the three basic techniques. The analysis uses random waveform computer simulation to investigate the SOCMA performance. The goodness of the random waveform simulation, in terms of simulation precision, is evaluated by application of the Chi-Square test. For this evaluation, a Quadratic/Gradient optimization algorithm is formulated which approximates the Chi-square surface in a local neighborhood of the mean and standard deviation by a parabolic surface. Utilizing this algorithm, a minimum Chi-square is found which yields the best fit of the normal distribution to the sample histogram distribution. Author (TAB)

N71-14753*# Israel Program for Scientific Translations, Ltd., Jerusalem.
EXTRATERRESTRIAL CIVILIZATIONS: PROBLEMS OF INTERSTELLAR COMMUNICATION
S. A. Kaplan, ed. 1971 271 p refs Transl. into ENGLISH of the publ. "Vnezemnye Tsivilizatsii Problemy Mezhzvezdnoi Svyazi' Moscow, Izd.Nauka, 1969 Supported by NASA and NSF
(NASA-TT-F-631; TT-70-50061) Copyright. Avail: NTIS CSCL 17B

The program of search for extraterrestrial signals and the problems involved in communication are discussed. The criteria which identify the probable artificial origin of a radio source are described. The first step in detecting radio sources of minimum angular dimensions is considered to be a radio survey of the sky. The effect of the space medium on the propagation of radio signals is reviewed. The general theory of communication and detection of signals are discussed with respect to the possibility of communication with extraterrestrial civilizations. Methods of decoding messages are given, emphasizing the linguist's point of view. Development rates of civilizations are stressed along with the problem of forecasting the development rates. Hypotheses regarding the existence of other intelligent worlds are also presented. N.E.N.

N71-14764*# General Dynamics/Convair, San Diego, Calif.
MEASUREMENT OF RADIO FREQUENCY NOISE IN URBAN, SUBURBAN, AND RURAL AREAS Final Report
A. H. Mills Dec. 1970 184 p
(Contract NAS3-11531)
(NASA-CR-72802; GDC-AWV70-001) Avail: NTIS CSCL 17B

Measurements were made in the urban, suburban, and rural areas of Akron, Ohio, at ground level and from the air. Characteristics of 300 MHz, 1 GHz, and 3 GHz noise data were recorded using specialized instrumentation systems developed for this application. The measurements were taken during various time periods of the day and at various locations about the city. Author

N71-14766*# Houston Univ., Tex. Wave Propagation Labs.
ALTITUDE DEPENDENT RADAR RETURN STATISTICS
H. S. Hayre and R. F. Broderick [1970] 19 p refs
(Contract NAS9-9828)
(NASA-CR-114803; TR-69-10) Avail: NTIS CSCL 17I

The mean square value of the radar scattering cross section area of the radar return from a random rough surface is usually employed. In the case of decreasing altitudes, the area beamwidth covered by the radar may approach the dimensions of the order of the surface decorrelation distance whereupon the local surface mean and a variance have significant effect of the backscattered energy and its statistics. Simultaneous measurements from a scatterometer as well as a Doppler radar system mounted in a helicopter are used to illustrate this significant change in the radar return statistics. Author

N71-14776# Royal Aircraft Establishment, Farnborough (England).
STAGE 1 TRIALS OF STORAGE AERIAL RADAR. NEW STAR
D. A. Beamish Aug. 1970 30 p refs
(RAE-TR-70138) Copyright. Avail: NTIS

An outline is given of the system and the results of tests and flight trials to determine range capability, track while scan ability and system stability. It was found that the range capability was in near accordance with calculation and that the short and long term stabilities were adequate for this stage of the project. The simple split gate system employed for track while scan was satisfactory for single isolated targets but proved inadequate for the crossing target requirements. It is concluded that sufficient success was obtained to justify continuance of the project to Stage 2 (the measurement of M.T.I. capability). Author

N71-14853# Michigan Univ., Ann Arbor. Radiation Lab.
CIRCUIT REALIZATION OF IMPEDANCE LOADING FOR CROSS SECTION REDUCTION
E. Lawrence McMahon Sep. 1970 38 p refs
(Contract F19628-68-C-0071)
(AD-713161; AFCRL-70-0514; SR-8; Rept-1363-7-T) Avail: NTIS CSCL 17/9

Techniques for realizing a reactance which is a decreasing function of frequency are discussed. A Negative Impedance Converter (NIC) circuit is analyzed and techniques given for compensating for imperfections and frequency dependence. An RC realization of the desired impedance is given, and it is demonstrated that this realization can be modified to compensate for phase shift in the NIC. An analytical and numerical analysis of a NIC based on amplifiers with 50 ohm input and output impedances is presented. Author (TAB)

N71-14854# Bendix Corp., Denver, Colo. Navigation and Control Div.
A FEASIBILITY STUDY FOR A NONPHOTOGRAPHIC SATELLITE TRACKING SENSOR Final Report, Apr.–Jul. 1970
Georg Rupprecht and T. J. Stevens 15 Oct. 1970 121 p refs
(Contract F19628-70-C-0161)
(AD-713162; STS-115; AFCRL-70-0436) Avail: NTIS

It is shown that the photographic plate in satellite triangulation can be replaced by an electro-optical device without loss of accuracy. The higher sensitivity and the unique storage capability of the electro-optical scheme increases the number of available target satellites and the number of available stars for positioning. A scheme has been developed where the accurate positioning of the satellite is accomplished by the retrieval of two times from the record, independent of metric distortions. The data evaluation is completely computerized without necessity of human interference. Author (TAB)

N71-14885# Naval Research Lab., Washington, D.C.
RADAR SEA RETURN IN HIGH SEA STATES Final Report
J. C. Daley, W. T. Davis, and N. R. Mills 25 Sep. 1970 51 p refs
(AD-713589; NRL-7142) Avail: NTIS CSCL 17/9

In order to obtain a more exact specification of the variation of the radar cross section of the sea with increasing sea roughness, and to determine a worst-case condition for sea clutter, a high-sea-state clutter measurement program in the North Atlantic was conducted. Radar return was collected on four frequencies in both linear and cross polarizations, and the normalized radar section sigma sub o of the sea surface was obtained as a function of radar and surface parameters for the high sea states encountered. The study of the behavior of the median value of sigma sub o as a function of the radar parameters and sea conditions resulted in the following conclusions at high sea states characterized by winds of 20-50 knots and wave heights of 10-28 ft: (a) the value of sigma sub o is independent of wavelength for vertical polarization but maintains an inverse wavelength dependence for horizontal polarization, (b) the direct polarization ratio remains significnt for all wavelengths as the sea roughness increases and is a function of wavelength, (c) the value of sigma sub o is sensitive to wind direction, with consistently higher clutter observed in the upwind direction for all wavelengths and both direct polarizations, and (d) the value of sigma sub o does not increase significantly with wind velocity in the region 20-50 knots, indicating that sigma sub o approaches a maximum value, or saturation, with increasing surface roughness. Author (TAB)

N71-14897# Army Electronics Command, Fort Monmouth, N.J. Electronic Components Lab.
NEODYMIUM YAG LASER FOR OPTICAL RADAR APPLICATIONS
John W. Strozyk and Vincent J. Rosati 1970 14 p refs
(AD-713582) Avail: NTIS CSCL 17/5

The development of the Nd:YAG laser resulted in a relatively simple Nd:YAG device with characteristics worthly of optical radar feasibility studies over short ranges, the results of which are presented here. The requirements includes the Nd:YAG laser as the transmitter, telescope optics for beam collimation, telescope optics to collect returning signals, a photomultiplier to process the signals and an oscilloscope to display the information. The design of each unit or component will be fixed by the laser characteristics and to some extent by the intended application (i.e. simple range data as compared to range rate data). The analysis or design of any radar system inevitably involves a radar range equation in one form or other. This approach is applicable to laser radars and has been used by many people under the assumption of having diffuse targets and constant atmospheric parameters. The results, while only approximations, are of acknowledged use and are developed here. Author (TAB)

N71-14898# Institute for Telecommunication Sciences, Boulder, Colo.
A RADIO-METEOROLOGICAL INVESTIGATION OF FADING AT GHz IN THE MEKONG DELTA
C. F. Peterson, L. J. Maloney, and C. A. Samson Sep. 1970 84 p refs
(AD-713128; ITS-248) Avail: NTIS CSCL 17/2

Intensive radio and meteorological measurements were conducted on two links of the Integrated Communication System in the Mekong Delta of South Viet Nam during January, February, and March 1970. This study investigated the possible causes of severe fading on these beyond-the-horizon links, with the objective of determining corrective action for existing paths in the Delta and improved design considerations for future systems. Measurement results indicated that subrefractive conditions were substantially more prevalent than had been expected on the basis of meteorological data obtained from Saigon. Author (TAB)

N71-14903# Naval Research Lab., Washington, D.C. Electromagnetic Propagation Branch.
FIELD STRENGTH MEASUREMENTS FOR NWC, NORTH WEST CAPE, AUSTRALIA Final Report, Sep.–Dec. 1967
C. B. Brookes and J. E. Raudenbush 23 Sep. 1970 135 p refs
(AD-713596; NRL-7148) Avail: NTIS CSCL 20/14

In the period from September to December 1967, the newest of the very-low-frequency (VLF) transmitting stations operated by the Navy, NWC, at North West Cape, Australia, had scheduled transmissions on six different frequencies in the VLF band. In order to obtain information on propagation paths not previously investigated, the Naval Research Laboratory installed instrumentation to collect data at selected sites in Japan, Madagascar, and Bahrain

Island. Transmissions were recorded continuously for a three-month period. Examination of the data allows determination of the optimum frequency for each path investigated. Author (TAB)

N71-14912# Radio Corp. of America, Moorestown, N.J. Missile and Surface Radar Div.

AN/PPS-18(XN-1) ULTRA RELIABLE RADAR Interim Development Report, 1 -30 Sep. 1970

J. D. Frattura 8 Oct. 1970 28 p

(Contract N00039-70-C-3502)

(AD-713707) Avail: NTIS CSCL 17/9

The program covers the study, design, construction, test analysis and inspection of a complete and operative, highly reliable, relative failure-free version of the pulsed doppler surveillance AN/PPS-6 radar set. The radar set is intended to be a lightweight, miniaturized, X-band, pulse doppler combat surveillance radar. The basic purpose of this program is to develop a highly reliable radar set considering the overall cost of ownership when development, production and maintenance costs are taken into account while keeping the same general performance, form-factor and weight as the AN/PPS-6 radar. Author (TAB)

N71-14913# Naval Postgraduate School, Monterey, Calif.

SONOBUOY LOCATION

Thomas Penn French, Jr. Sep. 1970 77 p refs

(AD-713077) Avail: NTIS CSCL 17/1

In airborne anti-submarine warfare operations there is a critical requirement for maintaining an accurate relative plot of the sonobuoys with respect to the aircraft. This study proposed a method for locating sonobuoys in a pattern using aircraft-to-buoy slant range information. The method did not use triangulation procedures and attempted to minimize the restrictions placed on the aircraft. The study showed the feasibility of the proposed methodology and the approximate errors to be encountered. Author (TAB)

N71-14914# White Sands Missile Range, N.Mex.

EXPLORATORY DEVELOPMENT OF THE WSMR CINETHEODOLITE Final Report

Lowell D. Yates Jun. 1970 226 p refs

(AD-713421; STEWS-RE-I-70-2) Avail: NTIS CSCL 17/8

A breadboard instrument was developed for the purpose of establishing the feasibility of a novel and unique type of theodolite with far greater dynamic pointing accuracy than is possible with conventional theodolites. This report documents the results of the test and evaluation and the measurement techniques employed. The report discusses design deficiencies of the breadboard instrument along with recommended improvements for future development of an operational instrument. Author (TAB)

N71-14915# Naval Research Lab., Washington, D.C.

SOME INFORMATION PROCESSES FOR ARRAYS OF SENSORS Interim Report

David Swick, F. Mansfield Young, and William Finney 1 Oct. 1970 50 p refs

(AD-713456; NRL-7181) Avail: NTIS CSCL 17/1

Representing an energy field over an interval of time by a single, multidimensional array of data permits formulations of the sensor-array problem that are well suited to use of known mathematical techniques on existing mathematical machines. One considers some resulting transformations and analysis procedures that can provide operationally useful information from operational acoustic arrays. In particular the report discusses multidimensional generalized transforms that map arrays of data into arrays of coefficients of basis functions and formal analysis procedures that operate on the arrays of coefficients to provide estimates of desired field or source parameters. The data arrays may result from nonuniformly spaced sample points in space and time. The basis functions are exemplified by exponentials in wavenumber-frequency space, and for that case analysis-of-variance techniques may be applied to the array of coefficients to provide estimates of the spatial and temporal frequency components of the field. Author (TAB)

N71-14918# Edgerton, Germeshausen and Grier, Inc., Bedford, Mass.

MEASUREMENT OF THE AMOUNT OF NONLINEARITY INTRODUCED BY AMPLITUDE DEPENDENT TIME DELAY

Bruce Kusse Sep. 1970 30 p refs

(Contract AT(29-1)-1183)

(EGG-1183-533) Avail: NTIS

A computer model of a nonlinear system with amplitude-dependent time delay is used to demonstrate the meaningful and practical measure of the linearity or nonlinearity of a system. Factors which affect the resolution and significance of the result are discussed. The procedure relies on methods of expressing the output of a system, linear or nonlinear, as a functional expansion of the input. If the system is linear, all multidimensional kernels except the one dimensional kernel, are zero and the relationship between the input and the output is the familiar, linear, superposition integral. E.M.C.

N71-14920# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

A SHORT-RANGE DIGITAL TELEMETRY SYSTEM FOR REMOTE POSITIONING REGULATOR CONTROLLERS

V. A. Skiba et al 9 Sep. 1970 13 p refs Transl. into ENGLISH from Mekhaniz. i Avtomatiz. Upravleniya (USSR), no. 4, 1968 p 59-62

(AD-713616; FTD-MT-24-159-70) Avail: NTIS CSCL 9/6

A remote system of multipoint process control is described, in which communication between the command center and its controlled stations is done via telemetry. Either existing telephone lines in the plant or added TM lines may be used. Control points are queried sequentially in binary code as to the correctness of their position, or are commanded to new set points on the basis of central computer calculations. The coded words used are the following: station address, task, proof of correctness, and verifications message received and correction made, and a break-off command. The method applies to electric or hydraulic motor controllers with voltage feedback to the summing point. An operating system described uses type RD-09 two-phase asynchronous control motors with 120-ohm potentiometer feedback. The system error is claimed not to exceed 1.5 percent. Author (TAB)

N71-14921# Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.

NAD WIDEBAND R-F DATA TRANSMISSION SYSTEM

R. M. Smith, H. W. Lorber, D. R. Libutti, J. J. Rose, and R. L. Nelson Aug. 1970 143 p refs

(EGG-1183-4030) Avail: NTIS

The practicality of wideband microwave digital data communication in the frequency band between about 4 and 8 GHz is discussed. A literature search and theoretical considerations form the basis of this report, the major portion of which examines wideband microwave ground-to-ground transmission anomalies. The effects of Gaussian noise, envelope fading, symbol distortion and intersymbol interference on the average system bit error rate are treated. Coherent phase shift keying is found to be the best form of carrier modulation. Several methods of avoiding signal degradation due to multipath propagation are considered. Methods of time-division multiplexing digital data at rates up to 160-MBit/sec are discussed. The sumbol-distorting effects of the non-linear phase

shift vs. frequency characteristic for waveguide transmission line is examined both theoretically and experimentally. Information is given for the effects of radiated-spectrum-limiting post-modulation filters on bit error rate. Author

N71-14922# Army Foreign Science and Technology Center, Washington, D.C.
PHASE CORRECTION ON A SMALL REFLECTOR IN A DOUBLE REFLECTOR ANTENNA [VOZMOZHNOSTI FAZOVOY KORREKTSII NA MALOM ZELKALE V DVUKHZERKALNOI ANTENNE]
A. L. Aizenberg 1 Sep. 1970 17 p Transl. into ENGLISH from Antenny (USSR), no. 2, 1967 p 166–178
(AD-713761; FSTC-HT-23-251-70) Avail: NTIS CSCL 9/5

The effect of the redistribution of energy in a double reflector system on the directive gain and noise temperature of an antenna with compensation of phase errors caused by deflections of the main (large) reflector by automatic correction of the shape of the auxiliary (small) reflector, is analyzed in approximations of geometrical optics. The maximum tolerable deformations of the reflectors for given deteriorations of the antenna characteristics can be determined on the basis of the results of the calculations. Author (TAB)

N71-14933# Westinghouse Research Labs., San Diego, Calif.
STUDY OF SOUND SCATTERING IN THE OCEAN Engineering Report, Jan.–Aug. 1970
Gila. Bank, William D. Clarke, Allen G. Haury, Al Kirst, Jr., and William P. Mullenhoff Aug. 1970 82 p refs
(Contract N00014-68-C-0366)
(AD-713238; Rept-70-9S10-OCEAN-R1) Avail: NTIS CSCL 17/1

The design, assembly and at sea testing of a six-frequency sonar array system are described. The system, being a new one, had some technical problems most of which were resolved during sea testing. Useful acoustic data were acquired with the sonar array system during the initial three week work period at sea and these data are partially analyzed. Author (TAB)

N71-14936# Sandia Corp., Albuquerque, N.Mex.
DEVELOPMENT OF A BROADBAND, WIDE DYNAMIC RANGE, SWEPT FREQUENCY ATTENUATION MEASUREMENT SYSTEM
Charles J. Still Sep. 1970 40 p refs Sponsored by AEC
(SC-DR-70-468) Avail: NTIS

Heterodyning sampling of a frequency translation technique was developed utilizing the combination of a network analyzer and a harmonic frequency converter. An internal phase lock loop was used to keep one channel of the two channel network analyzer tuned to the incoming signal. The IF signals were reconstructed from the sampler outputs, with frequency conversion having the same relative amplitudes and phases as the microwave reference and test signals. The advantages and limitations of the network analyzer for swept frequency are discussed. J.A.M.

N71-14951*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SPACE PROGRAMS SUMMARY NO. 37–65, VOLUME 2 FOR THE PERIOD 1 JULY–31 AUGUST 1970. THE DEEP SPACE NETWORK
30 Sep. 1970 167 p refs
(Contract NAS7-100)
(NASA-CR-115868; JPL-SPS-37-65-Vol-2) Copyright. Avail: NTIS CSCL 17B

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2. DESCRIPTION OF DSN SYSTEMS p 4–13 (See N71-14953 05-07)
3. PLANETARY FLIGHT PROJECTS p 14–23 (See N71-14954 05-30)
4. TRACKING AND NAVIGATIONAL ACCURACY ANALYSIS p 24–39 refs (See N71-14955 05-21)
5. COMMUNICATIONS SYSTEMS RESEARCH p 40–61 refs (See N71-14956 05-07)
6. COMMUNICATIONS ELEMENTS RESEARCH p 62–69 refs (See N71-14957 05-07)
7. SUPPORTING RESEARCH AND TECHNOLOGY p 70–85 ref (See N71-14958 05-07)
8. SFOF DEVELOPMENT p 86–101 (See N71-14959 05-07)
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10. DSIF DEVELOPMENT p 104–117 ref (See N71-14961 05-07)
11. DSN OPERATIONS p 118–125 ref (See N71-14962 05-07)
12. SFOF OPERATIONS p 126–131 refs (See N71-14963 05-07)
13. DSIF OPERATIONS p 132–153 refs (See N71-14964 05-07)
14. FACILITY ENGINEERING p 154–158 (See N71-14965 05-07)

N71-14952*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DESCRIPTION OF THE DSN
In its Space Programs Sum. No. 37-65, Vol. 2 for the Period 1 Jul.–31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 1–3 (See N71-14951 05-07)
Copyright. Avail: NTIS CSCL 17B

The Deep Space Network (DSN) is designed for two-way communications with unmanned spacecraft traveling approximately 10,000 miles from earth to planetary distances. To support flight projects, the DSN simultaneously performs advanced engineering on components and systems, integrates proven equipment and methods into the network, and provides direct support of each project through that project's tracking and data system. The DSN operation is characterized by six DSN systems: (1) tracking, (2) telemetry, (3) command, (4) monitoring, (5) simulation, and (6) operations control. The network is comprised of three facilities: the Deep Space Instrumentation Facility, the Ground Communications Facility, and the Space Flight Operations Facility. The operation of each of the facilities is described. R.B.

N71-14953*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DESCRIPTION OF DSN SYSTEMS
In its Space Programs Sum. No. 37-65, Vol. 2 for the Period 1 Jul.–31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 4–13 (See N71-14951 05-07)
Copyright. Avail: NTIS CSCL 17B

The functional design and validation of design concepts for complex systems of the magnitude of the Deep Space Network (DSN) employ modeling techniques, as well as practical methods for employing models as engineering tools. Monte Carlo simulation of systems operations provides an effective means of analyzing the influence of system structure upon the dynamic flow of traffic through the systems in many types of application. Monte Carlo simulation methods provide one effective aid to system analysis in the DSN for two basic reasons: (1) The DSN is a complex of identifiable elements through which traffic elements of several distinct types flow; and (2) The General Purpose Simulation System

program is readily available and provides a fairly complete and adaptable language for the construction and operation of simulation models on high-speed digital computers. Author

N71-14956*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
COMMUNICATIONS SYSTEMS RESEARCH
In its Space Programs Sum. No. 37-65, Vol. 2 for the Period 1 Jul.–31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 40–61 refs (See N71-14951 05-07)
Copyright. Avail: NTIS CSCL 17B

Communications systems research for the Deep Space Network is reported on the following topics: digital acquisition and detection, digital telemetry and command, finite-sample quantile estimation in communication statistics, analysis of random modulation in amplifier circuits in frequency generation and control, and angle demodulation using state-variable techniques. R.B.

N71-14957*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
COMMUNICATIONS ELEMENTS RESEARCH
In its Space Programs Sum. No. 37-65, Vol. 2 for the Period 1 Jul.–31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 62–69 refs (See N71-14951 05-07)
Copyright. Avail: NTIS CSCL 17B

Communications elements research for the Deep Space Network is reported on the following topics: microwave laser development for low noise receivers, improved calibration techniques for realizability conditions on reflection coefficients of unsymmetrical passive reciprocal two-part networks, and a noise-adding radiometer. R.B.

N71-14958*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SUPPORTING RESEARCH AND TECHNOLOGY
In its Space Programs Sum. No. 37-65, Vol. 2 for the Period 1 Jul.–31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 70–85 ref (See N71-14951 05-07)
Copyright. Avail: NTIS CSCL 09E

Deep Space Network supporting research and technology is reported on a 30-ft diameter reflector, a method for selecting antenna rigging angles to improve performance, low-frequency low-level stress reversals on an assembly of bolted joint specimens, switched-carrier operations, and Deep Space Station 13 operations. R.B.

N71-14959*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SFOF DEVELOPMENT
In its Space Programs Sum. No. 37-65, Vol. 2 for the Period 1 Jul.–31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 86–101 refs (See N71-14951 05-07)
Copyright. Avail: NTIS CSCL 17B

Development is reported on a digital television assembly for the Space Flight Operations Facility (SFOF), contrast ratio determination for the SFOF video image display, the Mark 3A simulation center, acceptance and maintenance routines for the SFOF Mark 3A central processing system, and high-speed data transmission for SFOF outbound communication. R.B.

N71-14960*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
GCF DEVELOPMENT
In its Space Programs Sum. No. 37-65, Vol. 2 for the Period 1 Jul.–31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 102–103 (See N71-14951 05-07)
Copyright. Avail: NTIS CSCL 09B

The Ground Communications Facility (GCF) of the Deep Space Network is connected to the SFOF by a full duplex synchronous transmission capability permitting 50 kbits/s data to be interchanged simultaneously in both directions between the SFOF and either field location of the ground stations. The wideband digital data system is to be used in the Mariner Mars 1971 mission. R.B.

N71-14961*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSIF DEVELOPMENT
In its Space Programs Sum. No. 37-65, Vol. 2 for the Period 1 Jul.–31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 104–117 ref (See N71-14951 05-07)
Copyright. Avail: NTIS CSCL 17B

Development and implementation are reported on the following for the Deep Space Instrumentation Facility: a passive microwave system to establish compatibility between the DSN and the various spacecraft prior to launch, a waveguide switch protector, Block 4 receiver automatic carrier acquisition, and recording of subcarrier demodulator assembly outputs for Mariner Mars 1971. R.B.

N71-14962*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSN OPERATIONS
In its Space Programs Sum. No. 37-65, Vol. 2 for the Period 1 Jul.–31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 118–125 ref (See N71-14951 05-07)
Copyright. Avail: NTIS CSCL 22A

Various operations of the Deep Space Network are reported. They include real-time selection and validation of telemetry data in the SFOF and DSN tracking system operations. An algorithm is presented for data selection and validation based on partial status indicators from telemetry data. R.B.

N71-14963*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SFOF OPERATIONS
In its Space Programs Sum. No. 37-65, Vol. 2 for the Period 1 Jul.–31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 126–131 refs (See N71-14951 05-07)
Copyright. Avail: NTIS CSCL 22A

The basic design for the Mariner Mars 1971 SFOF system was derived from an IBM 7094/7044 system and the Manned Spacecraft Center IBM 360/75 real-time operating system (RTOS). The Mariner Mars 1971 mission is the first of a type of mission with some fundamental characteristics different from previous unmanned missions and also from the type of mission the RTOS was designed to support. Some of the general problems that the SFOF must face in the post-1971 time period are outlined and the application of advances in the field of man-machine interaction to these problems is discussed. Author

N71-14964*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSIF OPERATIONS
In its Space Programs Sum. No. 37-65, Vol. 2 For the Period 1 Jul.–31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 132–153 refs (See N71-14951 05-07)
Copyright. Avail: NTIS CSCL 22A

The operations and facilities of the Deep Space Instrumentation Facility are described, including radio science support, computerized receiver and telemetry signal-to-noise predictions program, low transmitted power operation, and a tropospheric range refraction model. R.B.

N71-14965*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
FACILITY ENGINEERING
In its Space Programs Sum. No. 37-65, Vol. 2 for the Period 1 Jul.–31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 154–158 (See N71-14951 05-07)

Copyright. Avail: NTIS CSCL 17B

Two existing 85-ft-diam antenna stations at overseas locations are being upgraded to 210-ft antenna stations. The project includes the construction of two 210-ft antenna instruments, support facilities, and provisions for sufficient electronic equipment to meet the minimum performance requirements of spacecraft in the 1973 era. In addition to the antenna instrument, modifications must be made to the existing station facilities in order to adapt them for simultaneous use of the existing 85-ft antennas and the new 210-ft antennas. Author

N71-14986# Army Electronics Command, Fort Monmouth, N.J. Combat Surveillance Target Acquisition Systems Integration Lab.

A LIGHTWEIGHT ELECTRONIC SCANNING RADAR

Harold N. Tate 1970 10 p

(AD-713583) Avail: NTIS CSCL 17/9

An experimental radar is described that employs inertialess techniques which permit scanning a given azimuth sector without any physical motion of the antenna. The radar consists of a receiver-transmitter unit and a remote control unit. The antenna is made up of 16 line sources forming a flat plate array. The remote control unit utilizes a cathode ray tube as a Doppler-B type display. The remote control unit is capable of being remotely located up to 50 feet so as to afford operation from a secure position. Author

N71-14987# Joint Publications Research Service, Washington, D.C.

MICROWAVE RESEARCH

M. P. Dolukhanov 8 Jan. 1971 24 p Transl. into ENGLISH of the book 'Ot Milligerts Do Teragerts' Leningrad, Sudostroyeniye Press, 1970 p 81–103

(JPRS-52129) Avail: NTIS

The electromagnetic properties of microwaves are discussed. Factors affecting the propagation and attenuation of microwaves of various wavelengths are presented. The application of centimeter waves in marine radar and navigational equipment is reported. Microwave applications for space systems communication and navigation are reported. P.N.F.

N71-15451# Institute for Telecommunication Sciences, Boulder, Colo.

THEORETICAL LF, VLF FIELD CALCULATIONS WITH SPHERICAL WAVE FUNCTIONS OF INTEGER ORDER

J. Ralph Johler and Carlene Nellecker Apr. 1970 86 p refs

(ESSA-TR-ERL-165-ITS-106) Avail: NTIS

The propagation of LF and VLF terrestrial radio waves is simulated on the computer with a precise theory of sperical wave functions of integer order. Anisotropic reflections from an electron and ion density profile of the ionosphere are accommodated by the analysis. Variations in the profile and the magnetic field with distance along the propagation path can also be introduced ad hoc. The analysis method is incorporated into a computer program which is written in a flexible manner so that it can be applied to a variety of scientific studies of low-frequency ionospheric wave propagation. Calculations of current interest are presented to illustrate use of the technique. Amplitude perturbations of approximately 15 decibels are described at 60 kHz as a result of an electron density profile perturbation. It is also found that the 26 kHz signal is comparatively insensitive to a variation in magnetic dip angle when propagation occurs in the daytime near the magnetic equator. Thus, using values of the magnetic field vector at the center of the propagation path is a good approximation in certain circumstances. Author

N71-15453# Institute for Telecommunications Sciences, Boulder, Colo.

THE BASIS AND APPLICATION OF A SIMULATION MODEL FOR AN OCEANOGRAPHIC DATA TRANSMISSION SYSTEM USING HF RADIO

Dale N. Hatfield and Jean E. Adams Jun. 1970 29 p refs

(ESSA-TR-ERL-171-ITS-109) Avail: SOD $0.35

A digital computer program is described for simulating ocean data transmission systems that use high frequency radio. It is intended for use in the design and operation of the Integrated Global Ocean Station System (IGOSS) and the National Data Buoy Systems. Requirements for these two systems are reviewed, and important factors affecting overall transmission system performance are identified. The program predicts performance as a function of these parameters for use in cost effectiveness studies. A baseline system is described, and sample results from the program are given. Author

N71-15498# National Aviation Facilities Experimental Center, Atlantic City, N.J.

INVESTIGATION OF TRANSPONDER REPLY FADE-OUT IN THE VICINITY OF CHICAGO O'HARE AIRPORT Interim Report, Mar. – May 1970

George F. Spingler Dec. 1970 54 p

(FAA-RD-70-75; FAA-NA-70-49) Avail: NTIS

The results of flight tests in the vicinity of O'Hare Airport, Chicago, Illinois to determine the cause of transponder fading are presented. Analysis of the flight test data showed that the major cause of the coverage problem centered around the towers of a remote transmitter site and propagation vertical lobing. Author

N71-15530# Research Inst. of National Defence, Stockholm (Sweden).

CURRENT INVESTIGATIONS INTO THE PROPAGATION OF RADIO WAVES [RADIOVAGORS UTBREDNING - AKTUELL FORSKNING]

Folke Eklund May 1969 27 p In SWEDISH

Avail: NTIS

The propagation of radio waves along the earth's surface in the troposphere and in the ionosphere has been studied for many years. The theories on the mode of propagation have been well developed and verified experimentally when applied to the mean course of the propagation. Progress in the technique however, has made it possible to develop new systems using free radio waves. These systems often permit such specific performance that the disturbances allowed by irregularities in the wave propagation constitute serious limitations. The investigation is accordingly directed to theoretical and experimental measurement of the radio wave propagation, both temporally and spatially, and to giving better forecasts for different conditions of wave propagation. In this connection it is important that the propagation media, i.e. ionosphere, troposphere and surface of the earth, be described in more detail. Author

N71-15564# Joint Publications Research Service, Washington, D.C.

UNDERWATER COMMUNICATION SET

V. Kazhberov et al 11 Jan. 1971 10 p Transl. into ENGLISH from Radio (Moscow), no. 10, 3 Sep. 1970 p 42–45

(JPRS-52138) Avail: NTIS

A telephonic apparatus is described for underwater communications, operating on an ultrasonic frequency. Transformation of the audio fluctuations to electrical ones in the underwater set is achieved with the type LT-5 throat microphones and communication is accomplished by use of the AM ultrasonic vibrations at a frequency of 72 kc. The modulated fluctuations are converted to ultrasonic ones with the aid of a piezoelectric emitter with an efficiency of about 30 percent. The receiver is spanned

by a deep AVC which assures a variation in the output signal level by not more than 6 db at a variation of 66 db in the input level. The underwater set makes use of a telephone with skin conductivity and is powered by three type KBS-L 0.5 batteries connected in series. D.L.G.

08 COMPUTERS

Includes computer operation and programming; and data processing. For basic research see: 19 Mathematics.

N71-14579# California Univ., Berkeley. Lawrence Radiation Lab.
DESIGN OF A VERY LARGE STORAGE SYSTEM
Samuel J. Penny, Robert Fink, and Margaret Alston-Garnjost Jun. 1970 24 p refs Presented at the Fall Joint Computer Conf., Houston, Tex. Revised
(Contract W-7405-eng-48)
(UCRL-19757-Rev; CONF-701101-1; Rept-87) Avail: NTIS

The Mass Storage System, built around the IBM 1360 photodigital store, offers the users of the CDC 6600 computer complex at the Lawrence Radiation Laboratory a facility for the storage, management, and retrieval of very large volumes of data. The system is capable of storing 3 × 10 to the 11th power bits of data on-line to the computer. Maximum access time is 5 seconds. Off-line archival storage is unlimited and data can be moved back on-line within a short time. The design decisions are discussed and the hardware and software are briefly described. Author (NSA)

N71-14654*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A GENERALIZED DIGITAL CONTOURING PROGRAM
Ruben L. Jones Washington Jan. 1971 80 p refs
(NASA-TN-D-6022; L-7273) Avail: NTIS CSCL 09B

A computer program which generates contour charts from depth matrices has been written. The maximum dimensions of the depth matrix are 60 by 60. Each element of the matrix is computed from a weighted series of gradients, each of which is computed from neighboring control points. A maximum of 1000 control points can be processed at one time. Author

N71-14723*# Intermetrics, Inc., Cambridge, Mass.
ENGINEERING STUDY FOR A MASS MEMORY SYSTEM FOR ADVANCED SPACECRAFTS Final Report, 1 Dec. 1969–1 Jul. 1970
Alex L. Kosmala, John P. Green, and Fred H. Martin Aug. 1970 206 p refs
(Contract NAS9-9763)
(NASA-CR-108672) Avail: NTIS CSCL 09B

Designs for the next generation of manned space vehicles are currently being formulated. They involve advanced computer systems performing comprehensive tasks of guidance, control, navigation, monitoring, data reduction, and communication. It is expected that the new generation of onboard computing systems will demand the on-line availability of vastly increased storage resources. This investigation was undertaken to: (1) determine the characteristics required of each category of memory in the necessary hierarchy to enable it to be implemented by specific technologies; (2) determine from a detailed search and review which of the existing, or proposed, memory technologies would be the most suitable for implementation of each category; and (3) perform these tasks in order to determine the feasibility of operational memory systems for advanced manned space vehicles for two distinct and separately considered time periods, namely 1975 and 1980. A.L.

N71-14752*# Illinois Univ., Urbana. Coordinated Science Lab.
FUNCTIONAL DIAGNOSABILITY AND RECOVERY FROM MASSIVE FAULTS IN DIGITAL SYSTEMS Quarterly Progress Reports, 17 May–16 Nov. 1970 (Final)
Gernot Metze 16 Nov. 1970 17 p refs
(Contract NAS8-25158)
(NASA-CR-115867; QPR-3; QPR-4) Avail: NTIS CSCL 09B

Investigations of the fault recovery characteristics have been carried out on: (1) the JPL-STAR; (2) the multiprocessor proposed by Koczela and Wang; and (3) the Bell Telephone System ESS #2. This analysis has indicated definite strengths and weaknesses in each design and has suggested possible areas of improvement in the design of reliable spaceborne computers. The general configurations of the three systems are reviewed along with the strengths and weaknesses encountered during the investigation. A.L.

N71-14778*# Computer Sciences Corp., Huntsville, Ala. Systems Development Operations.
EXTENDED SPL: AN ASSEMBLY LANGUAGE FOR THE SCC 4700 COMPUTER
Billy P. Buckles 21 May 1970 48 p
(Contract NAS8-18405)
(NASA-CR-102990) Avail: NTIS CSCL 09B

The syntax requirements and coding aids available for constructing source statements for ESPL are presented. Examples and tables are used to explain the relationships between the symbolic source statements and the machine data that is generated. Author

N71-14779# National Environmental Satellite Center, Washington, D.C.
DATA REDUCTION PROCESSES FOR SPINNING FLAT-PLATE SATELLITE-BORNE RADIOMETERS
Torrence H. Macdonald Jul. 1970 40 p refs
(ESSA-TR-NESC-52) Avail: SOD $0.50; NTIS

Physical concepts and mathematics used in processing radiation data from the cartwheel satellites ESSA 3, 5, 7, and 9 are described. Author

N71-14781# Nebraska Univ., Lincoln. Inst. of Computational Sciences.
A COMPUTER PROGRAM FOR THE CALCULATION OF ELECTRON SCATTERING AND PHOTOIONIZATION CROSS SECTIONS OF ATOMIC SYSTEMS WITH CONFIGURATION (npl^q)
M. J. Conneely, Lester Lipsky, Kenneth Smith, P. G. Burke (Queens Univ., Belfast), and R. J. W. Henry (Louisiana State Univ., Baton Rouge) [1969] 33 p refs
(Rept-70.058) Avail: NTIS

The program makes it possible to study the scattering of an electron by an atom or ion with configuration (npl^q), where N = 2 or 3, or 0< or =q< or = 6, under the assumption that all the ground state terms are closely coupled, but no excited terms contribute. It is similar to the Hartree-Fock method for bound states in that the total wave-function of the system is diagonal in total orbital angular momentum, total spin, and parity, and is represented by a sum of Slater determinants. The wave functions for the core electrons are represented by analytic SCF functions. Author

N71-14829# Weapons Research Establishment, Salisbury (Australia).
A STUDY OF HIGH-SPEED ANALOGUE-DIGITAL CONVERSION
D. P. Ramsey Mar. 1970 33 p refs
(WSO-118) Avail: NTIS

One of the limiting factors in modern digital radar signal processing systems has been the interface between the analogue and digital sections; the analog to digital converter. A study of high-speed A/D conversion is described, and a working system which combines high-speed with low cost is presented. Author

N71-14830# British Steel Corp., London (England). Operational Research Dept.
A COMPARISON OF THE LEGIBILITY OF THREE TYPES OF ELECTRONIC DIGITAL DISPLAY

G. C. Simpson [1969] 11 p refs
(OR/HF/17/69) Avail: NTIS

A series of experiments was carried out to compare the legibility of three different types of electronic digital display. The three displays, namely the cold cathode, the side illumination and the straight projection types, were examined under conditions of varying light level and viewing position. The two performance criteria used in the investigations were recognition time for a single digit and accuracy of report of a four digit number. Results indicated that there was little difference between the cold cathode and the straight projection types under the conditions used in the experiment. However, the side illumination display led to a significantly poorer performance score than either of the other two displays. It was also shown that performance decrements would result if any of the displays was used in ambient light levels of greater than 22 foot candles. Author

N71-14873# Wisconsin Univ., Madison. Mathematics Research Center.
A COMPUTER PROGRAM FOR INTERACTIVE MANIPULATION OF FINITE GROUP PRESENTATIONS
F. D. Crary Feb. 1970 133 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-713697; MRC-TSR-1045) Avail: NTIS CSCL 12/1

An interactive computer program for manipulating finite group presentations is described. A brief mathematical background is provided along with operating instructions and notes on the programming. An illustrative example is included. Author (TAB)

N71-14874# Army Electronics Command, Fort Monmouth, N.J.
AUTOMATED RAW ENVIRONMENTAL DATA PROCESSING
William A. Huber 1970 14 p refs
(AD-713543) Avail: NTIS CSCL 9/2

Technology advances in military information gathering have resulted in the accumulation of large volumes of data that to be effectively utilized must be processed with a minimum time delay. Where this data is directly representative of raw environments, it generally requires human handling for filtering, classification, and subsequent generation, via keyboard, of an electrical code to effect entry into the military automatic data processing system. This manual procedure detracts from the timelessness of the data. The report presents a solution to the problem by using an adaptive learning computer system. Author (TAB)

N71-14875# Sandia Corp., Albuquerque, N.Mex.
WONDY 3a: A COMPUTER PROGRAM FOR ONE-DIMENSIONAL WAVE PROPAGATION
R. J. Lawrence Aug. 1970 185 p refs Sponsored by AEC
(SC-DR-70-315) Avail: NTIS

WONDY 3 is the latest in a series of one-dimensional finite difference wave propagation computer programs. In general, this computer program solves the finite difference analogs to the one-dimensional differential equations of motion as expressed in Lagrangian coordinates. The geometry employed can be either spherical or cylindrical if the motion is in the radial direction only, or rectangular in which case the motion is assumed to occur along the x-axis only. The latter of these three is the familiar case of uniaxial strain, appropriate for a plate of infinite lateral extent. Since WONDY is most frequently used to solve problems involving the propagation of pressure discontinuities or shock waves, the method of artificial viscosity is employed. Author

N71-14937# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE PROGRAM INTERRUPTION ROUTINE FOR THE ELECTRONIC COMPUTER DNEPR 1
E. P. Dmitriev et al 21 Aug. 1970 12 p Transl. into ENGLISH from Upravlyayushchie Mashiny i Sistemy (USSR), v. 2, 1968 p 19–25
(AD-713787; FTD-MT-24-80-70) Avail: NTIS CSCL 9/2

Circuit schemes and subroutine programs are described for the computer Dnepr-1, which permit one to realize an interruption mode for effectively inputting new information arriving along telephone and telegraph communication channels. At the arrival of a signal, two machine states are possible: (a) computation in accordance with the main program, and (b) stop. Depending upon this condition two interruption modes are distinguished. A description is given of the operation of the circuit scheme and subroutine program which affect the input of information and the return to the principal program where it was interrupted. Author (TAB)

N71-14948# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE SYSTEM FACILITY OF AN ELEMENTARY MACHINE OF THE MINSK-222 COMPUTER SYSTEM
G. P. Lopato et al 9 Sep. 1970 37 p refs Transl. into ENGLISH from Vychisl. Sist. (USSR), no. 23, 1966 p 35–67
(AD-713776; FTD-MT-24-118-70) Avail: NTIS CSCL 9/2

The system facility of an elementary machine of the Minsk 222 computer system is described as the functional units which carry out the commands of the system. These commands include the commands of transmission, input, set-up, and general unconditional transfers, and are associated with the shifting of information among elementary machines. This facility also handles the intermachine transfer of operating information. The facility consists of three basic units: a commutator, a set-up register, and systems operations unit. The commutator is composed of a commutation circuit handling the working channel, priority channel, and a synchronization channel, all of which are of the impulse type. The set-up register has a record for the current partition or subsystem of operation, as well as a circuit of potential cores for control. The systems operations unit contains an operations decoder, a central distributor of impulses, a link with the operating memory 1unit, a command address retriever, links with peripheral units and with the control console, register controls, control transfer devices, and a tape address calculator. The facility arrangements are discussed in some detail. Author (TAB)

N71-14949# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SEVERAL STRUCTURAL METHODS FOR INCREASING THE PRODUCTIVITY OF DIGITAL COMPUTERS
E. A. Aleksandrov et al 13 Aug. 1970 14 p refs Transl. into ENGLISH from Sb. Statist. i Elektronno-Vychislitelnoi. Tekn. v. Elektron. (USSR), v. 1, 1966 p 288–294
(AD-713773; FTD-MT-24-79-70) Avail: NTIS CSCL 9/2

Many structural methods of improving the productivity and operational potentialities of digital computers can be subdivided into two fundamental groups: the development of new structures of programing and initial languages and the development of structural schemes of interconnections between units in the computer. A tentative classification is offered of various structures widely used at present. The parallelism methods, that is, all the methods from joint elementary machine operations to simultaneous filling several programs belonging to different problems, are briefly examined. The following new concepts in the structural organization of digital computers are briefly considered: organization of a fixed structure, organization of a unitized structure, organization of a program-changed structure, and a self-organized structure. Author (TAB)

N71-14950# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
POSSIBILITIES OF APPLYING A DIGITAL ASSOCIATIVE MACHINE IN INFORMATION PROCESSING METHODS
E. A. Bratalskii et al 9 Sep. 1970 15 p Transl. into ENGLISH from Mekhaniz. i Avtomatiz. Upr. (USSR), no. 6, 1968 p 58–58
(AD-713769; FTD-MT-24-95-70) Avail: NTIS CSCL 9/2

The possibilities of special associative memory computers are considered as an aid in certain forms of information processing.

It is proposed that a digital associative machine be devised which would perform non-computational tasks on massive volumes of input data, such as sorting, searching, or tagging, and thus relieve the general-purpose computer of these time-consuming operations. Block diagrams are given, and a typical sorting program using a digital associative machine is described. Operating on a word of m bits simultaneously against n reference standards increases the handling speed by at least (n) x (m) times, compared to the standard computer. Sorting speeds can thus be increased by 100-200 times, and operation speeds of a given sec are foreseen. The digital associative machine concept would be most useful in real-time operations where a real high-volume flow of information must be handled. Author (TAB)

N71-14877# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SEVERAL QUESTIONS IN THE SELECTION OF STRUCTURE OF FLIGHT CONTROL COMPUTERS

V. A. Popov et al 17 Aug. 1970 12 p refs Transl. into ENGLISH from Samoletostroenie i Tekhn. Vozdushnogo Flota (USSR), no. 12, 1967 p 52–55

(AD-713786; FTD-MT-24-108-70) Avail: NTIS CSCL 9/2

A mathematical approach is proposed for selecting optimum computers for flight control systems on the basis of their speed of computation, their productivity, and their effectiveness. It is stated at the beginning that only digital computers should be considered. The computers should be selected to suit the best for a certain class of problems. The speed is defined as the number of average operations performed in a unit of time during the solution of a typical problem and it can be expressed by a given equation. This method does not take into account the complexity of particular operations which can be taken care of by introducing a universal algorithmic unit of problem complexity. The given equation would change. Since the speed may vary from problem to problem, it is necessary to find a norm for a group of problems representing the certain class for which the computer is being selected. At a given reliability in solving a certain group of problems, the mathematical expectation of a random quantity is defined. The productivity can be defined as the ratio of the volume of calculating tasks required to solve a problem to the time lost in solving the problem. It can be expressed by a given equation. Author (TAB)

N71-14889# Forsvarets Forskningsanstalt, Stockholm (Sweden). Avdelning 4.

A SYSTEM FOR A/D CONVERSION AND DIGITAL RECORDING AT FOA'S OBSERVATORY IN HAGFORS [SYSTEMET FOER A/D-OMVANDLING OCH DIGITAL REGISTRERING VID FOA:S OBSERVATORIUM I HAGFORS]

K. Kogeus Aug. 1969 11 p In SWEDISH

(FOA-4-C-4397-20) Avail: NTIS

A system for analog-to-digital conversion and digital recording of seismological signals was installed. The system is controlled by a small computer and data is written at 800 symbols/inch on magnetic tape according to the IBM standard. Author

N71-14998*# Old Dominion Univ. Research Foundation, Norfolk, Va. School of Engineering.

NUMERICAL INTEGRATION AND OTHER TECHNIQUES FOR COMPUTER AIDED NETWORK DESIGN PROGRAMMING Final Technical Report, 1 Jan. 1970–1 Jan. 1971

Charlie H. Cooke and Eddie H. Young (Radiation, Inc., Melbourne, Fla.) Jan. 1971 48 p refs

(Grant NGR-47-003-026)

(NASA-CR-111837) Avail: NTIS CSCL 09B

A limitation to the capability of first generation computer aided network design programs occurs for the case of networks characterized by so-called stiff systems of first order differential equations. Methods for strengthening this capability were studied. A matrix method for a limited class of networks is developed, which avoids numerical integration, the usual source of difficulty. The performance of Gear type implicit linear multistep methods of numerical integration is investigated, and the mathematical structure essential in the construction of this class of algorithms is obtained. Author

N71-14999*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

ASTRONAUT/COMPUTER COMMUNICATION STUDY: PHASE A TASK 3 AND INTERMEDIATE REPORT

Nov. 1970 69 p refs

(Contract NAS8-25701)

(NASA-CR-102883; MDC-G0852) Avail: NTIS CSCL 09B

The objective is to identify the onboard crew functions which can be performed or assisted by an onboard graphic-display computer system. Methods for onboard function execution must be devised and a crew/computer communication's language must be developed. Phase A was restricted to (1) analyzing and evaluating existing and near-term space vehicles for state-of-the-art onboard computer capability and technology development, (2) identifying current and proposed onboard crew functions, and (3) devising preliminary methods and language requirements to be utilized in performing the onboard functions. Author

N71-15426*# Logicon Inc., San Pedro, Calif.

ADVANCED SOFTWARE TECHNIQUES FOR SPACE SHUTTLE DATA MANAGEMENT SYSTEM Interim Report

Michael D. Richter, Richard C. Rountree, Raymond J. Rubey, and Steven A. Vere 20 Nov. 1970 38 p

(Contract NAS9-11225)

(NASA-CR-114802; IR-1) Avail: NTIS CSCL 09B

An analysis of space shuttle functions and estimates of their probable computational impact are given. Advantages and disadvantages of alternative computer configurations and architectures are included in the discussion. Author

N71-15427# Bureau of Mines, Denver, Colo. Mine Systems Engineering Group.

A GRAPHICAL METHOD OF REMOVING OUTLIER VALUES FROM ANALYTICAL DATA

E. E. Remmenga and R. G. Burdick Jan. 1971 13 p refs

(BM-RI-7472) Avail: Issuing Activity

Often a collection of analytical data, which should reasonably be expected to follow the normal distribution, contains too many extreme values, which the experimenter is inclined to eliminate according to some arbitrary procedure. The stepwise computer procedure described for this purpose is similar to many other truncation procedures; however, because truncation of a basically normal distribution causes a downward bias in the estimated variance, this procedure provides a graphical method to compensate for the bias. Author

N71-15432# General Accounting Office, Washington, D.C.

FURTHER IMPROVEMENT NEEDED IN THE MANAGEMENT OF MAGNETIC TAPES BY GODDARD SPACE FLIGHT CENTER, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION Report to the Congress by the Comptroller General of the United States

Elmer B. Staats 22 Apr. 1970 40 p refs

(B-164392) Avail: Issuing Activity

A review is presented of magnetic tape operations at GSFC along with recommendations made by GAO for improvement in procedures. Separate sections deal with the following: (1) procedures established for release of magnetic data tapes from storage; (2) data collected from satellites and stored without being processed; (3) need for more effective controls over digital tapes furnished to experimenters; and (4) need to expand capacity for rehabilitating used magnetic tapes. D.L.G.

N71-15499# Aeronautical Research Labs., Melbourne (Australia).
ANALYSIS OF DETERMINISTIC AND RANDOM DATA
N. J. Sullivan Mar. 1970 37 p refs
(ARL/ME-312) Avail: NTIS

The proper selection of techniques and equipment for the analysis of random and unique data depends fundamentally on an understanding of the nature of the original data. Classification of data types and the appropriate analysis techniques are discussed in this report. Only analogue analysis systems are treated for unique data but both analogue and digital analysis systems are presented and compared for random stationary data. Derivations of the Fourier Transform, the Power Spectral Density Function, and the Auto-correlation Function are presented, together with the expression relating the latter two functions. A typical analysis problem is presented as an example and conclusions drawn as to the most appropriate analysis technique in terms of equipment complexity, ease of analysis, and total analysis time. The information presented in this report has application to the interpretation of experimental data in the fields of vibration, acoustics, communications, and other similar areas where the frequency distribution of the data is of importance. Author

N71-15500# Department of Transportation, Washington, D.C. Office of Research and Development.
ELECTRONIC COMPUTER PROGRAM FOR STEREOCOMPARATOR COORDINATE REDUCTION, TIES COMPUTER PROGRAM NO. R-0100
Mar. 1970 63 p refs
Avail: Issuing Activity

The development of this computer program was motivated by the increased interest shown by highway organizations in analytical aerial triangulation coupled with the lack of a program for automatically reducing stereocomparator measured coordinates from photographs with four side fiducials. This program was originally written in FORTRAN IV for the CDC 6600 computer and then converted for use on an IBM 360 by introducing the DOUBLE PRECISION feature to minimize errors due to round-off. The program consists of a main calling program and 20 subroutines. It was written for reducing coordinate data derived from a Wild STK-1 Stereocomparator, but with minor modification to the READ subroutines it can be used to reduce data derived from other stereocomparators. Author

N71-15529# Research Inst. of National Defence, Stockholm (Sweden).
A STUDY VISIT CONCERNING THE PROCESSING OF MEASURED DATA [STUDIEBESOEK AVSEENDE MAETDATABEHANDLING]
Christer Ankersjoe, Ingemar Karlsson, and Gilbert Larsson Sep. 1969 13 p In SWEDISH
Avail: NTIS

In order to gather experience in data transfer with subsequent data processing, a study visit was made to SAAB of Linkoeping. The visit proved valuable in the exchange of information and points of view which could have direct application to the system planned for processing data from rocket trials. Author

N71-15535*# Cambridge Memories, Inc., Newton, Mass. Magnetic Thin Film Development Dept.
STUDY OF ADVANCED ASSOCIATIVE PROCESSOR TECHNIQUES Final Report
Harvey I. Jauvtis Jul. 1970 257 p refs
(Contract NAS12-2220)
(NASA-CR-115866) Avail: NTIS CSCL 09B

The application of DOT (Domain Tip) logic to the design of an associative processor was studied, and solutions to most of the basic problems were obtained. In particular, word selection logic and memory cell structures were designed, implemented, and found to function satisfactorily. Techniques for performing the various search and processing operations required of an associative processor for spaceborne applications were developed and methods considered for reducing the basic search cycle time. Materials and fabrication studies were also undertaken in an effort to improve existing multilayer and laminated film techniques. A possible design for a 1000 word, 100 bits per word DOT associative processor and a discussion of system characteristics and tradeoffs is submitted. Author

N71-15578# California Univ., Berkeley. Lawrence Radiation Lab.
LOW-COST SOURCE DATA TERMINAL FOR TECHNICAL TEXT
Loren P. Meissner, Mansfield L. Clinnick, and Robert A. Belshe Feb. 1970 16 p refs Presented at IEEE Computer Group, Washington, D.C., 16 – 18 Jun. 1970
(Contract W-7405-eng-48)
(UCRL-19390; CONF-700625-1) Avail: NTIS

A low cost source data entry station, for the entry of technical text into computer files was assembled from commercially available hardware, specially constructed interfaces, and carefully tailored software. A keyboard is provided for entry of Latin and Greek alphabetic characters in upper and lower case, as well as numbers and about 100 special symbols. As the characters are entered, they are displayed on a CRT screen by a software character generator which can also display any character in superscript, subscript, italic, or bold face. Control keys are provided for specifying insertions, deletions, and other text modifications with direct display on the CRT screen. A facsimile recorder provides reasonably fast low cost hard-copy output with adequate resolution. The configuration of the hardware presently in use is described, as well as projections to a commercially feasible system which would consist of a PDP-8 computer with 8-K core, 32-K disc, one or more terminals (each consisting of a keyboard and a storage scope), a facsimile recorder, and the necessary interfaces. Hardware characteristics of the interfaces are described, as well as the overall system design of the software and the data structures used. Author

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N71-14794# California Univ., Livermore. Lawrence Radiation Lab.
CALIBRATION OF IMPEDANCE METERS AND BRIDGES TO 50 MHz
W. E. Bostwick 23 Jun. 1970 6 p refs Presented at the 25th Ann. Conf. on Instr. Soc. of Am., Philadelphia, 28 – 29 Oct. 1970 Sponsored by AEC
(UCRL-72485; CONF-701005-1) Avail: NTIS

Some impedance meters and bridges are at least partially computer designed and theoretically are as accurate as they are said to be. It is desirable to calibrate these meters or bridges by external standards at these phase angles other than 0, −90, or +90 degrees. The advent of precision connectors, and the availability of capacitors and through-type coaxial resistors provides part of the calibration standards. One line of well-known inductors can be modified by replacement of the banana plugs with precision connectors. These standards may be combined to give several values of R + jX. Since these devices all have precision connectors, they will be accepted for calibration by NBS, Boulder. Methods of user calibration are discussed and the results are compared with those obtained at NBS. Author

N71-14841# Army Electronics Command, Fort Monmouth, N.J. Electronics Components Lab.

ANALYSIS AND APPLICATION OF GALLIUM ARSENIDE AVALANCHE TRANSIT TIME DEVICES

Joseph J. Baranowski and Vincent J. Higgins [1970] 15 p refs (AD-713509) Avail: NTIS CSCL 9/1

The theoretical analysis of gallium arsenide avalanche transit time devices has been presented. This analysis has established the criteria for optimum design of oscillators and amplifiers and has led to the application of these devices in Army communications and radar systems. Author (TAB)

N71-14870# Aerospace Corp., El Segundo, Calif. Lab. Operations.

ADMITTANCE, ISOLATION, AND RADIATION PATTERNS OF RECTANGULAR SLOT ANTENNAS IN THE PRESENCE OF A SIMULATED REENTRY SHEATH Research Report, Jul. 1969–Jun. 1970

Gordon E. Stewart and Kurt E. Golden 1 Jul. 1970 19 p refs (Contract F04701-70-C-0059)
(AD-713702; TR-0059(6220-10)-2; SAMSO-TR-70-308 Avail: NTIS CSCL 9/5

The admittance, isolation, and element radiation patterns of reduced-height rectangular slot antennas in a plasma-clad ground plane were measured and compared with theoretical predictions. The plasma sheath simulates the electromagnetic properties of a high-altitude boundary layer and is produced by pulsed electron beam emission from the ground plane in the presence of a low-pressure gas. Author (TAB)

N71-14872# Corning Glass Works, Raleigh, N.C. Electronic Research Lab.

ULTRA-STABLE MICROWAVE CAVITY Final Report, Jun. 1969–Jun. 1970

J. R. Kim, J. J. Pan, and J. Singletary Griffiss AFB, N.Y. RADC Aug. 1970 104 p refs
(Contract F30602-69-C-0049)
(AD-713127; RADC-TR-70-158; P-41-14) Avail: NTIS CSCL 9/5

The report covers the development of stable fundamental microwave sources which derive their frequency stability from resonators made of very low thermal expension glass and glass-ceramic materials. Three different source configurations at L-, S-, and X-bands were analyzed and constructed. The resonator feedback source was selected as the principal type. Computer optimization of an S-band source circuit of this type resulted in a measured source temperature stability of plus or minus 1.88 x 10 to the minus 7 power parts/ C over the -25C to + 75C temperature range. This is in substantial agreement with the calculated stability. This source showed a frequency stability plus or minus 9 x 10 to the minus 9 power parts/hour when averaged over a 34-hour period in a constant environment. Author (TAB)

N71-14884# Sandia Corp., Albuquerque, N.Mex.

COMPUTER-AIDED ANALYSIS MODEL FOR THE JUNCTION FIELD-EFFECT TRANSISTOR

Glenn R. Case Jul. 1970 53 p refs Sponsored by AEC (SC-DR-70-368) Avail: NTIS

The FET differs from the transistor in several important respects. While the transistor works on the basis of exciting carrier movement across the forward-biased emitter junction, the FET works on the basis of controlling the resistance in the channel from source to drain. While the base-emitter junction of the transistor is forward-biased, giving rise to a relatively low impedance from base to emitter, the FET gatesource junction is reverse-biased so that the device has an inherently high input impedance. In the transistor, the current-voltage characteristic is basically an exponential characteristic, whereas in the FET the current-voltage characteristic is approximately a 3/2 power law. For the transistor, increasing voltage on the base-emitter junction above zero volts (for the NPN) causes increasing current; the n channel FET, however, operates more akin to a vacuum pentode in that bias is normally held below zero volts and increasing to zero causes increasing current flow. The FET is a lower frequency device, in general, than the transistor, although several devices operating up to hundreds of megahertz have been developed. In addition, FET's normally have much higher saturation voltages than bipolar transistors. Author

N71-14906# Army Foreign Science and Technology Center, Washington, D.C.

A PARAMETRON MIXER [O PARAMETRONE SMESHANNOGO TIPA]

V. M. Yurkevich 11 May 1970 13 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Ukrainian SSR), v. 6, no. 3, 1968 p 267–274
(AD-713467; FSTC-HT-23-154-70) Avail: NTIS CSCL 9/5

The results are given for theoretical analysis and experimental verification of a parametron having two modulated parameters, which utilizes varactors as non-linear capacitances. Author (TAB)

N71-14984# Army Foreign Science and Technology Center, Washington, D.C.

GENERAL PURPOSE MICROCAPACITOMETER [UNIVERSALNYI MIKRODOZATOR]

V. P. Pristavko 11 Jun. 1970 7 p Transl. into ENGLISH from Zashchita Rast. (USSR), no. 11, 1969 p 47–48
(AD-713473; FSTC-HT-23-851-70) Avail: NTIS CSCL 6/2

During entomological investigations it often becomes necessary to apply strictly dosed individual treatment of insects with insecticides, chemosterilizers, microbial preparations, etc. A variety of microcapacitometers are used for this purpose, and they are often quite complex and expensive. The design and operation of a general purpose microcapacitometer are presented. The device is simple in design and economical to manufacture. It can be used for a variety of purposes with a wide range of doses. The error of the device is plus or minus 0.004 mm. Author (TAB)

N71-15413# Sandia Corp., Albuquerque, N.Mex. Library Reference Div.

A FULLY AUTOMATIC CONTROL FOR POINT-BY-POINT RECORDING OF X-RAY PROFILES USING A 3-CRYSTAL DIFFRACTOMETER [EINE VOLLAUTOMATISCHE STEUERUNG ZUR PUNKTWEISEN AUFNAHME VON ROENTGENPROFILEN MIT EINEM DREIKRISTALLDIFFRAKTOMETER]

H. Strunk et al 29 Sep. 1970 7 p refs Transl. into ENGLISH from Messtechnik (West Germany), v. 11, 1968 p 271–273
(SC-T-70-4037) Avail: NTIS

The construction of a simple electronic apparatus which serves to automate a three-crystal diffractometer and which has been employed very successfully for the precise point-by-point measurement of X-ray reflexion curves is described. This diffractometer setup consists of three crystals, at which the X-ray

is reflected consecutively: (1) a monochromator crystal; (2) the sample crystal under investigation; and (3) an analyzer crystal. At a given position of the 3rd crystal, the sample crystal is swung back and forth in such a manner - about an axis which is perpendicular to the plane of radiation, with a constant angle velocity - that the sample-crystal's total reflection range is comprised within the chosen Bragg reflex. This integrally measured intensity yields a test point for the reflection curve to be ascertained. Author

N71-15482# Naval Intelligence Command, Alexandria, Va. Translation Div.
STATIC SYSTEM FOR THE AUTOMATIC CONTROL OF ELECTRIC DRIVE
14 Oct. 1970 96 p refs Transl. into ENGLISH from the publ. 'Beskontaktnye Sistemy Avtomaticheskogo Upravleniya' Moscow, Iz-Vo, 1968 p 189–192, 195–197, 202–221, 243–271, and 275–300
(AD-713386; NIC-Trans-3125) Avail: NTIS CSCL 9/3

Another paper reviewed the circuitry for automatically controlling the processes involved in starting and braking direct and alternating current motors by relay-contact equipment. Speed regulation was accomplished by inserting resistance in the motor armature or rotor circuits. But it is known that this speed regulation method causes a deterioration in mechanical characteristics and motor speed to become unstable, depending on the load. When the drive is required on the one hand to provide broad and smooth speed regulation, and on the other to maintain an assigned speed, regardless of load, recourse is had to closed automatic speed regulation systems using various types of electrical machines, and magnetic, electronic, and semiconductor components. Drives, the bases of which are contactless magnetic and semiconductor components, and particularly controlled tubes (thyratrons), have an especially good future. TAB

N71-15528# Research Inst. of National Defence, Stockholm (Sweden).
BROAD BAND LINEAR POWER AMPLIFIER FOR THE VHF BAND [BREDBANDIGA LINJAERA EFFEKTFOERSTAERKARE FOER VHF-BANDET]
Hans Bergdal Jun. 1969 36 p refs In SWEDISH
Avail: NTIS

Measurements and calculations for the selection of a broad band linear power amplifier with an output of 1W and a frequency range of 140 to 200 MHz are presented. A description of the practical construction and the results of measurements on the finished amplifier are also given. Author

N71-15531# Research Inst. of National Defence, Stockholm (Sweden).
INVESTIGATING LOSSES IN A SLOT ANTENNA WITH VOLTAGE CONTROLLED DIODES [UNDERSOEKNING AV FOERLUSTER I EN SLITSANTENN MED SPAENNINGSSTYRDA DIODER]
Boerje Johnsson Jul. 1969 28 p refs In SWEDISH
Avail: NTIS

A slot antenna with voltage controlled diodes is a type of antenna in which the radiation can be rapidly varied in amplitude and phase by means of the varactor diode bias. The antenna element is intended for fixed antenna arrays in radar systems with electronic scanning which operate at high sweep rates. An investigation into the size of the losses as a function of the degree of modulation is presented. Two different measuring methods were used. The influence of the matched element on the progress of the wave in the waveguide is also examined. Author

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see: Specific Physics Categories.

N71-14751# Research Inst. of National Defence, Stockholm (Sweden).
ELECTRICAL MEASURING TECHNIQUE IN THE HIGH FREQUENCY AND MICROWAVE RANGES [ELEKTRISK MAETTEKNIK INOM HOEGFREKVENS- OCH MIKROVAGSOMRADENA]
Ralph Bostroem Sep. 1969 10 p refs In SWEDISH
(FOA-3-C-3599-68) Avail: NTIS

The study visit was made to obtain an insight into the state of development of techniques for measuring electrical quantities in the high frequency and microwave ranges. The report is limited to experiments and observations considered to be either new or of general interest and which have not been published previously. Author

N71-14760# Pisa Univ. (Italy). Ist. di Elettronica.
GENERATING DIRECT CURRENT WITH REGULATED CONSTANT VOLTAGE BY USING A FEEDER WITH NEGATIVE IMPEDANCE OUTPUT [GENERATRICE DI CORRENTE CONTINUA REGOLATA A TENSIONE COSTANTE MEDIANTE UN ALIMENTATORE AD IMPEDENZA D'USCITA NEGATIVA]
Fulvio Capparelli and Giovanni Marola 10 Sep. 1968 26 p refs In ITALIAN *Its* Ser. 25, No. 1239
Avail: NTIS

The use of a feeder with a negative output impedance for voltage regulation in generating direct current in a normal series was investigated. The system is described, and the transient behavior is examined. The schemes of the regulator system are presented. Transl. by F.O.S.

N71-14856# Syracuse Univ., N.Y. Dept. of Electrical Engineering.
COMPUTER PROGRAMS FOR RADIATION AND SCATTERING BY ARBITRARY CONFIGURATIONS OF BENT WIRES
Hu H. Chao and Bradley J. Strait 15 Sep. 1970 102 p refs
(Contract F19628-68-C-0180)
(AD-713156; SR-7; AFCRL-70-0374) Avail: NTIS CSCL 20/14

The problem of electromagnetic radiation and scattering from thin wires with arbitrary shape and with arbitrary excitation and loading is considered. This is treated as a boundary value problem which is formulated as an operator equation. Matrix methods along with the method of moments are used to solve the operator equation approximately. Computer programs suitable for handling radiation problems and plane-wave scattering problems are presented and described. For the former, current distributions, field patterns, and input impedances at the driving points are determined. For the latter, current distributions and bistatic radar cross section patterns are found. Examples are given to illustrate several applications of the programs. Numerical results are compared with experimental data and with results computed by other theoretical methods. Author (TAB)

N71-14881# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Electrophysics.
A TUTORIAL EXPOSITION OF THE FUNDAMENTAL

NETWORK-THEORETIC IDEAS UNDERLYING MODERN INSERTION-LOSS FILTER DESIGN

Dante C. Youla Griffiss AFB, N.Y. RADC Sep. 1970 119 p refs

(Contract F30602-69-C-0053)

(AD-713720; PIBEP-70-056; RADC-TR-70-182) Avail: NTIS CSCL 9/5

From the outset research in Network theory has been propelled forward by the desire to build superior filters incorporating the many practical constraints in a realistic way. The early emergence of the image-parameter method of filter design was quite natural since in concept it was based squarely on a modal picture, so familiar in classical physics. However, despite its uncontested intuitive appeal the image-parameter philosophy has two rather pronounced drawbacks. First, the description of a lumped 2-port in terms of irrational functions such as image impedances, propagation constants, etcetera, instead of polynomials, is perhaps unnatural from the point of view of good pedagogy. Second, the terminations demanded by the theory are the image impedances of the filter and not the resistors which must actually be employed in practice. A great deal of effort (and ingenuity) is required to evaluate and equalize this mismatch effect, especially for wide-band designs. Nevertheless, it is fair to say that when the technique is applicable it works well and quickly and the treatise by Cauer must be considered definitive. Author (TAB)

N71-14882# Texas Univ., Austin. Center for Cybernetic Studies.

COALITIONS IN N-PERSON ESSENTIAL GAMES

A. Charnes and S. Sorensen Jun. 1970 20 p refs

(Contracts N00014-67-A-0126-0008; N00014-67-A-0126-0009)

(AD-713693; CS-28) Avail: NTIS CSCL 12/2

A notion of a solution of an n-person essential game is developed based on the core of a game. This solution exists for every essential game but is not unique. A bargaining procedure is developed which gives some insight into which coalitions may actually form. It can be characterized by means of linear programs. Author (TAB)

N71-14883# California Univ., Berkeley. Electronics Research Lab.

ELECTROMAGNETIC WAVE-CHARGE INTERACTION IN CROSSED FIELDS Final Report, 15 May 1967 – 15 Jun. 1970

K. A. Fox, M. A. Meyer, S. Swierkowski, C. W. Turner, T. Van Duzer et al Sep. 1970 90 p

(Contract DAB07-67-C-0227)

(AD-713399; ERL-70-4; ECOM-0227-F) Avail: NTIS CSCL 9/1

The purpose of the work on this contract is to investigate the interaction of electromagnetic waves and charge carriers in vacuum and solids. A crossed-field microwave vacuum-tube amplifier has been designed for low-noise operation. The paraxial crossed-field gun design method has been extended to use on magnetically shielded guns. A study of optically stimulated emission from a cathode of suitable form for a crossed-field tube has been conducted. An experimental and theoretical study of electromagnetic and space-charge waves in semiconductors has been performed. A study has been made of the propagation and amplification of bulk acoustic waves in crossed electric and magnetic fields. A study of surface-wave amplification on InSb in crossed electric and magnetic fields has been made. Author (TAB)

N71-14905# Union Carbide Corp., Oak Ridge, Tenn. Computing Technology Center.

DIGITAL FILTERING AND SPECTRAL COMPARISON USING THE FAST FOURIER TRANSFORM

M. R. Patterson, E. C. Long, and F. L. Miller, Jr. (Oak Ridge Natl. Lab., Tenn.) 22 Sep. 1970 35 p refs

(Contract W-7405-eng-26)

(CTC-44) Avail: NTIS

A method of digital filtering which uses the fast Fourier transform is presented. Derivations necessary to compute a convolution integral using the discrete, finite Fourier transform are included. This method offers an advantage in speed over conventional methods. The symmetry assumptions and the role of the impulse response function are discussed. A particular statistical test of two empirical spectral distribution functions, the Kolmogoroff-Smirnoff test, is introduced to test whether two distribution functions are the same or different. Author

N71-14923# Houston Univ., Tex. Cullen Coll. of Engineering.

DIELECTRIC FIELD COMPUTATIONS IN SEMICONDUCTOR OXIDE INTEGRATED CIRCUITS

Don L. Cannon Jul. 1970 72 p refs

(Contract N00014-68-A-0151; Proj. Themis)

(AD-713476; THEMIS-RE-3-70) Avail: NTIS CSCL 9/5

The report deals with the application of the point relaxation method for the numerical solution of Laplaces or Poissons equations in multi-dielectric regions in semiconductor integrated circuits. In particular, the type of geometry considered in this report is a rectangular or square region whose boundary potentials may or may not be specified, with a dielectric interface parallel to one of the bounderies. This type of problem is very difficult to solve analytically and yet it is an important problem in planar integrated circuit analysis. The structure is essentially the same as the oxide over silicon or as the junction regions in such a device. Often the electrical field or the static temperature distribution of such regions are required and the research described in this report provides a technique for determining such information. Author (TAB)

N71-14924# Houston Univ., Tex. Cullen Coll. of Engineering.

SEMICONDUCTOR INTEGRATED CIRCUIT COMPONENT MODELS

Don L. Cannon Jul. 1970 39 p refs

(Contract N00014-68-A-0151; Proj. Themis)

(AD-713475; THEMIS-RE-2-70) Avail: NTIS CSCL 9/1

The report attempts to summarize the presently available models for feasibly describing the active and passive components in an integrated structure. Emphasis is on a presentation of the basic approach of the model with references given for the detailed derivation and characterization of the model. Author (TAB)

N71-14925# Navy Electronics Lab., San Diego, Calif.

A FORTRAN PROGRAM FOR WAVEGUIDE PROPAGATION WHICH ALLOWS FOR BOTH VERTICAL AND HORIZONTAL DIPOLE EXCITATION Interim Report

Richard A. Pappert, Linda R. Shockey, and William F. Moler 15 Jun. 1970 77 p refs Sponsored by DASA

(AD-713168; NELC-IR-702) Avail: NTIS CSCL 20/14

The report presents an updated version of an earlier waveguide program written in the FORTRAN compiler language. The new program includes the following additions: (1) Provision for calculating excitation factors for all electric field components Ex, Ey, and Ez as a function of height within the guide. (2) The excitation factors can be generated for both vertical and horizontal electric dipole exciters. Author (TAB)

N71-14926# Air Force Academy, Colo. Frank J. Seiler Research Lab.

AN EXACT SOLUTION TO AN ADAPTIVE LINEAR ESTIMATION PROBLEM

Kenneth D. Senne Sep. 1970 37 p refs

(AD-713098; SRL-TR-70-0014) Avail: NTIS CSCL 9/4

An exact analysis of a particular form of adaptive estimator is presented. The result is the explicit evolution of the mean square estimation errors in general time-varying environments, as well as

necessary and sufficient conditions for convergence of the estimates and explicit corresponding solutions in the presence of step changes in signal statistics. The estimator in question involves a gradient-following algorithm for recursively computing the solution to a discrete aprroximation to the Wiener-Hopf integral equation. The term adaptive is used to indicate that the gradient-following is permitted to continue indefinitely resulting in the capability of adjusting to sudden or unexpected evolutionary changes in process statistics at any time. Convergence of the estimates is defined in terms of the fractional excess mean square error or misadjustment maintained by the random estimator weights. Adaptive estimator convergence is intentionally weaker than stochastic approximation convergence so that precise knowledge of the time-varying nature of f the statistics is not required in order to obtain satisfactory mean-square-error performance. The specific problem which is analyzed exactly involves zero-mean, mutually gaussian distributed, independent sample vectors. The assumption of intersample independence is in part justified by the detailed analytical results which provide for the first time a prototype for the synthesis of adaptive estimators suitable for truly nonstationary environments.
Author (TAB)

N71-14975# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHOD OF LAYING OUT PRINTED CIRCUITS
G. E. Shiro et al 27 Aug. 1970 22 p Transl. into ENGLISH of the book 'Primenenie Vychislitelnykh Mashin Dyla Analiza Ustoichivosti i Tokov Korotkogo Zamykaniya v Energosistemakh' Kiev, Naukova Dumka, 1968 p 199–215
(AD-713615; FTD-MT-24-109-70) Avail: NTIS CSCL 9/5

A method of laying out printing combinations, making it possible to achieve a high density of printed conductors for highly complex circuits is proposed. The method considers electrical, structural and technological requirements on the printed wiring.
Author (TAB)

N71-14976*# Northeastern Univ., Boston, Mass.
DIFFUSION AND STRUCTURAL CHANGES IN MICROCIRCUIT INTERCONNECTIONS Semiannual Progress Report, 1 Dec. 1969–30 May 1970
W. B. Nowak 30 May 1970 29 p refs
(Grant NGR-22-011-060)
(NASA-CR-115903) Avail: NTIS CSCL 09C

Gold, platinum, and gold-on-platinum films, 1000-3000A thick, were thermally evaporated onto glass microscope slides and given various heat treatments at about 300 C. The room temperature electrical resistivity and spectral reflectivity were observed during the course of the heat treatments. Platinum films show a large decrease in resistivity and a concomitant increase in reflectivity, which are associated with an amorphous to crystalline phase transformation having an activation energy of 10,000 cal/mole for the initial stages. This transformation appears to be oxygen-assisted. Preliminary data indicate a diffusion coefficient for Pt in Au that is near to that of volume diffusion. Author

N71-15514# Pisa Univ. (Italy). Inst. of Electronics.
STUDY OF A SPECIAL SYSTEM FOR REGULATING DIRECT CURRENT OF A TRIPHASE ALTERNATOR [STUDIO DI UN PARTICOLARE SISTEMA DI REGOLAZIONE A CORRENTE CONSTANTE DI UN ALTERNATORE TRIFASE]
F. Capparelli, R. Dalmazzo, and G. Marola Oct. 1969 29 p refs In ITALIAN
(Publ-114; Rept-1285) Avail: NTIS

A special system for regulating direct current is described for the stabilization of the current amplitude in a triphase alternator by a charge in passive equilibrium. Schematic diagrams are presented. Transl. by F.O.S.

N71-15515# Pisa Univ. (Italy). Inst. of Electronics.
SOME CONSIDERATIONS ON CIRCULAR DIAGRAMS OF TRIPHASE INDUCTION MOTORS [ALCUNE CONSIDERAZIONI SUL DIAGRAMMA CIRCOLARE DELLA MACCHINA TRIFASE AD INDUZIONE]
G. Mariotti and M. Lemmi-Gigli 1969 20 p refs In ITALIAN
(Publ-116; Rept-1287) Avail: NTIS

Polar diagrams of asynchronous triphase motors are used to study geometric effects, the network connecting the rotor and stator, and for the identification of working parameters under loads. Simple analytic functions are derived for two equivalent circuits which measure the losses in iron. Transl. by F.O.S.

N71-15516# Pisa Univ. (Italy). Inst. of Electronics.
SYNCHRONOUS SMOOTH ROTOR IN A SPECIAL SYSTEM FOR AUTOMATIC REGULATION OF FIELD CURRENT [SUL SINCRONO A ROTORE LISCIO PROVVISTO DI UN PARTICOLARE DISPOSITIVO PER LA REGOLAZIONE AUTOMATICA DELLA CORRENTE DI CAMPO]
G. Marriotti and M. Lemni-Gigli 1968 34 p refs In ITALIAN
(Publ-115; Rept-1286) Avail: NTIS

The static behavior of an isotropic triphase synchronous motor in parallel to a network, and part of a system dependent on the coupling angle to the field winding is studied. Using excitation functions, an auxiliary synchronous motor is investigated which provides two orthogonal excitations, one constant, and the other dependent on a retroactive scheme of the phase of the static voltage. In that mode, the charge characteristics are dependent on the conventional signs for determining the parameters regulating excitation. The experimental results are considered to be in satisfactory agreement with the theories. Transl. by F.O.S.

N71-15517# Pisa Univ. (Italy). Inst. of Electronics and Radio Controls.
FREQUENCY DISCRIMINATOR WITH SEMICONDUCTORS WITHOUT INDUCTION COMPONENTS [DISCRIMINATORE DI FREQUENZA A SEMICONDUTTORI PRIVO DI COMPONENTI INDUTTIVI]
F. Capparelli and A. Liberatore 1970 41 p refs In ITALIAN
(Publ-2; Rept-1284) Avail: NTIS

Various techniques for simulating inductance by microminiaturized circuits are reviewed, and a circuit is presented for a frequency discriminator which can be produced in either thick or thin films. The circuit is a variation of the resonance discriminator in that an active by-pass network which is activated by its resistance and capacitance is substituted for the complex components of the inductor. Schematics of the circuitry are presented.
Transl. by F.O.S.

N71-15518# Pisa Univ. (Italy). Inst. of Electronics.
A NEW CONTRIBUTION TO REGULATING VOLTAGE FROM A DIRECT CURRENT GENERATOR [NUOVO CONTRIBUTO ALLA REGOLAZIONE A CORRENTE COSTANTE DI UNA GENERATRICE DI CORRENTE CONTINUA]
F. Capparelli and G. Marola Nov. 1968 19 p refs In ITALIAN
(Publ-23; Rept-1238) Avail: NTIS

A system for regulating high voltage in a direct current generator by using an auxiliary dynamo instead of an internal negative resistance is described. The static and dynamic behavior of the system is analyzed, and schemes of the regulator are included. Transl. by F.O.S.

N71-15527# Pisa Univ. (Italy). Faculty of Engineering.
SOME CHARACTERISTICS OF THE BEHAVIOR OF A TRIPHASE INDUCTION MACHINE WITH THE STATOR AND

ROTOR CONNECTED BY TWO NETWORKS AND DEPENDENT ON THE NETWORK FREQUENCY [SU ALCUNI CARATTERISTICI ASPETTI DI COMPORTAMENTO DELLA MACCHINA TRIPHASE A INDUZIONE, CONNESSA SULLO STATORE E SUL ROTORE A DUE RETI PREVALENTI, IN RELAZIONE AI VALORI DELLE FREQUENZE DI RETE]

G. Mariotti and M. Lemmi-Gigli 1969 31 p refs In ITALIAN *Its* 26 Series, No. 1288
(PUBL-117) Avail: NTIS

The voltage and frequency of the stator network, and the static behavior of an induction triphase machine with simultaneous input to the stator and rotor are analyzed to determine the voltage and frequency of the rotor network. The functional behavior is presented in polar diagrams which indicate the effective, and asynchronous fields. It is shown that the rotor frequency varies with the rotating fields of the stator and rotor; the characteristics of the machine change continuously; the potential output varies with the coupling angle; and the amplitude changes depend on the stability of the rotor. Transl. by F.O.S.

N71-15575# Nagoya Univ. (Japan). Inst. of Plasma Physics.
USE OF CONFORMAL MAPPING TO IMPROVE UNIFORMITY OF ELECTRIC FIELD

Sunao Kawasaki Nov. 1970 14 p refs
(IPPJ-T-4) Avail: NTIS

The form of simple auxiliary electrodes attached to two parallel plates system deflecting charged particles is determined by a comformal mapping technique so that the end effect of the electric field can be cancelled. It is shown that the uniformity of the field is improved only by a small modification of the shapes of the parallel plates at their ends. Author

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N71-14529# Institute for Nuclear Physics Research, Amsterdam (Netherlands).
EVA: THE 85 MeV LINEAR ELECTRON ACCELERATOR (VERSNELLER) PROJECT AT AMSTERDAM

P. J. T. Bruinsma, J. G. Noomen, and C. de Vries *In its* Phys. with the 85 MeV Electron Linac Oct. 1970 7 p refs (See N71-14528 05-11)
Avail: NTIS

Efforts to increase the maximum energy to approximately 90 MeV and to improve the intensity of the analyzed beam to levels suitable for measurements of low inelastic scattering cross sections are reported. The modifications to the replacement accelerator are described. R.B.

N71-14782# Sandia Corp., Albuquerque, N.Mex.
MEASUREMENT CAPABILITIES OF THE SANDIA LABORATORIES, LIVERMORE, STANDARDS LABORATORIES

J. L. Wilson Aug. 1970 28 p Sponsored by AEC
(SCL-DR-70-83) Avail: NTIS

The material presented summarizes the principle measurement services provided by the laboratory and lists the nominal levels of measurement accuracy that can be obtained. Author

N71-14810# Institute for Defense Analyses, Arlington, Va. Urban Mass Transportation Project.
INTRA-AIRPORT TRANSPORTATION SYSTEMS: AN EXAMINATION OF TECHNOLOGY AND EVALUATION METHODOLOGY

Dec. 1969 164 p refs
(Contracts DAHC15-67-C-0011; DOT-UT-43(IAA))
(AD-702738; IDA/HQ-69-10734; S-351) Avail: NTIS CSCL 1/5

The study examines the technology and analytic techniques available to provide assistance in arriving at solutions to intra-airport transportation problems. A number of proposed transportation systems are examined and their capabilities are compared to the future requirements of major U.S. airports. Technological deficiencies of proposed systems are identified, and possible major research, development, and demonstration programs are suggested. In addition, two typical airport transportation problems are identified, and simple analytical methods are developed for their solution. The applicability of both are analytical techniques and the available technology to other (non-airport) transportation problems is discussed. Author (TAB)

N71-14895# Bucher and Willis, Salina, Kans.
AIRPORT MASTER PLAN FOR CITY OF POPLAR BLUFF, MISSOURI

Dec. 1969 164 p Sponsored in part by Dept. of Commerce
(PB-189720) Avail: NTIS CSCL 01E

The purpose of this study is to inventory the present airport conditions, explore the probable airport usage by 1990 and to develop an airport plan to satisfy these estimated 1990 use demands. The findings of this study are summarized on the Poplar Bluff Airport Layout Plan and in this report. Author (USGRDR)

N71-14896# Aerospace Research Labs., Wright-Patterson AFB, Ohio. Energetics Research Lab.
DESCRIPTION OF A NOZZLE TEST FACILITY Final Report

Brian Quinn, Charles N. Eastlake, and Richaj B. Fancher Aug. 1970 52 p
(AD-713130; ARL-70-0140) Avail: NTIS CSCL 14/2

The mechanical properties of a facility designed to study the characteristics of hybrid nozzles are described. Castigliano's method is used to analyze the deflection and load relationship of the rigid but elastic system. Experiments substantiate the analysis and confirm the capability for measuring nozzle thrust with a high degree of precision. The second part of the report describes tests with a family of axisymmetric nozzles. Also included is a detailed statement of calibration and testing procedures and an assessment of the total system accuracy. Author (TAB)

N71-14902# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
RAPID ASSESSMENT OF AIRCRAFT LANDING SITES

Richard G. Ahlvin and George M. Hammitt, II 1970 14 p refs
(AD-713502) Avail: NTIS CSCL 1/5

The procedure described in the paper permits rapid survey of entire landing sites by use of any available standard ground vehicle. Specifically, the process is one of selecting a standard vehicle, such as a 2-1/2-ton cargo truck, traversing a potential landing area, and noting the rutting. From the degree of rutting, a direct projection of allowable operations of any aircraft can be readily determined. Author (TAB)

N71-14929*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
MSC CONTAMINATION CONTROL PROGRAM REQUIREMENTS MANUAL, VOLUME 1 AND VOLUME 2

Sep. 1970 160 p refs
(NASA-TM-X-58041; MSC-M-5322-Vol-1-Vol-2) Avail: NTIS CSCL 14B

The MSC Contamination Control Requirements Manual establishes the requirements and criteria for coordinated contamination control activities. The manual was prepared to provide, in a single document, the minimum controls necessary to establish and maintain an effective contamination control program. The facility, operations, and personnel controls, along with the design, development, manufacture, inspection, and test controls, are delineated. Author

N71-14980# Purdue Univ., Lafayette, Ind. Dept. of Physics.
STATUS AND PERFORMANCE OF THE PURDUE SMP MEASURING SYSTEM
R. L. McIlwain, F. J. Loeffler, and T. R. Palfrey, Jr. [1970] 9 p ref Presented at the 10th Intern. Conf. on Data Handling Systems in High Energy Phys., Cambridge, England Sponsored in part by AEC
(COO-1428-209; CONF-700323-2) Avail: NTIS

The time sharing measuring facility consists of 5 SMP's and 2 NRI film-plane microscopes coupled to an IBM 360/40 through a multiplex channel. The 360/40, having only 8K 32-bit words, cannot hold full track-banks from the SMP's. It therefore stores track section buffers onto a 2311 disk file as they come in, until the SMP operator indicates end of data. Completed tracks (or fiducials) are then read into an IBM 360/44, where they are filtered. Smooth points are stored by the 360/44 on another 2311 disk workfile, track-view by track-view. The online geometry is evaluated, and the overall system performance is discussed. NSA

N71-14981*# National Aeronautics and Space Administration. Langley Station, Va.
A SIMULATOR STUDY OF THE CONTROL OF LUNAR FLYING PLATFORMS BY PILOT BODY MOTIONS
Paul R. Hill and David F. Thomas, Jr. Washington Dec. 1970 53 p refs
(NASA-TN-D-6016; L-7304) Avail: NTIS CSCL 05I

Results are presented of an investigation of body motion control of lunar flying platform configurations utilizing shirt-sleeved operators and a simulator with five degrees of freedom. The results show that lunar vehicles with moments of inertia up to 100 slug sq ft in pitch and 300 or 400 slug sq ft in roll should have satisfactory control qualities. The separation of the vehicle operator and thrust jets from the high inertia vehicle elements by means of a low inertia auxiliary platform resulted in satisfactory control in both pitch and roll over the range of equivalent lunar moments of inertia of 33 to 400 slug sq ft. A description of a number of useful variations of body motion control is presented. Author

N71-14988# Advisory Group for Aerospace Research and Development, Paris (France).
WIND TUNNEL PRESSURE MEASURING TECHNIQUES
P. S. Bynum (Aro, Inc.), R. L. Ledford (Aro, Inc.), and W. E. Smotherman (Aro, Inc.) Dec. 1970 99 p refs
(AGARD-AG-145-70) Avail: NTIS

A description of basic modern equipment and techniques available for wind tunnel pressure measurements is presented. Pressure measurements in wind tunnels are of interest not only for determining the pressure distribution on aerodynamic shapes, but also for determining test conditions in the wind tunnel test section. Wind tunnel pressure measurements are most frequently accomplished by use of transducers. A summary of the characteristics of the major types of pressure transducers is provided. Author

N71-15414# California Univ., Livermore. Lawrence Radiation Lab.
DESIGNING FLYER-PLATE/GUN EXPERIMENTS TO PROVIDE SHARP COMPRESSIVE SHOCKS AND SOFT RECOVERY OF TARGETS
Richard J. Wasley, Robert H. Valentine, and Ernest J. Nidick, Jr. 2 Jun. 1970 16 p refs Sponsored by AEC
(UCRL-50887) Avail: NTIS

The construction of a gun-fired projectile head that will generate a sharp compressive-shock pulse in a target and the soft recovery of the target after the impact are discussed. At projectile velocities of $\leq$ or = 0.3 millimeters per microsecond, a planar and well-defined shock pulse can be achieved from a thin flyer plate (0.1 to 1 millimeter) backed with a rigid, open-cell carbon foam of density 0.1 to 0.2 grams per cubic centimeter. The target can be recovered without damage after the impact (for flying velocities of up to about 0.8 millimeter per microsecond) with a collapsible telescope arrangement and doughnut-shaped momentum-pickup plates. The plates slow the projectile gradually to ensure that it remains intact; the target passes through a hole in the plates and is caught in foam. The decelerating projectile deflects the propellant gases and debris from the target. Author

N71-15428# Air Force Systems Command, Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
TWO INDEPENDENT CALIBRATION METHODS USED IN TESTING LOW MASS FLOW RATE SENSORS IN ELECTROGASDYNAMIC FACILITIES Technical Report, Apr. 1963 – Apr. 1966
D. W. Young Aug. 1970 53 p refs
(AD-713625; AFFDL-TR-70-60) Avail: NTIS CSCL 14/2

Development of a system for measuring the mass flux profiles in an arc heated gasdynamic wind tunnel is described. Two independent calibration systems were developed for calibrating the low mass flow rate meter. One system is based on the pressure rise method and the other on the positive displacement technique. A combination mass flux and impact pressure probe was designed and utilized as a flow diagnostic instrument. The mass flux measuring system was capable of measuring rates of flow from .00000025 to .0004 pounds per second at test section simulated altitudes of 160,000 feet. Dynamic response of the flowmeter permitted continuous traverses of the core of the flow at speeds of 0.5 inch per second. Comparisons are made between mass flow rates as measured by the facility mass flowmetering system and those obtained by integrating the mass flux probe data. Author (TAB)

N71-15429# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. Electromagnetic Effects Lab.
SIMULATION OF HIGH ALTITUDE IONIZED AIR WITH AN ARTIFICIAL DIELECTRIC
William Gray and George Merkel 1970 15 p refs
(AD-713531) Avail: NTIS CSCL 20/14

A number of nuclear electromagnetic pulse simulators have been constructed to simulate various nuclear electromagnetic pulse environments. These simulators yield a variety of pulse magnitudes, pulse shapes, polarizations, angles of arrival, etc. Present techniques for the simulation of the interaction between an in flight missile and a nuclear electromagnetic pulse do not include the effect of ionized air that can be produced by the Compton-recoil electrons arising from the interaction of gamma-rays with the atmosphere. The paper describes a relatively modest program at the Electromagnetic Effects Laboratory at MERDC in which one is investigating the possibility of developing simulation methods that include some of the effects of the presence of an ionized air plasma when a nuclear EMP interacts with a missile or satellite. Author (TAB)

N71-15448# Joint Publications Research Service, Washington, D.C.
INTERSEASONAL RENOVATION OF RADAR STATIONS
P. Papushin 3 Dec. 1970 5 p Transl. into ENGLISH from Tekhn. i Vooruzheniye (Moscow), no. 10, 14 Sep. 1970 p 36–37
(JPRS-51916) Avail: NTIS

The experience of antiaircraft armed forces personnel in the winter operation of radar stations has shown that the increased humidity, low temperatures, and strong winds of the winter season affect the performance of certain units and assemblies, and lead to instability in many electrical parameters. In order to maintain apparatus in constant readiness, engineering-technical personnel of subunits take seasonal preventive measures as specified in the directions for operation. In this connection, particular care is given to lubrication changes, checking the antenna-feeder systems, cleaning ventilation apparatus, checking the electrical system, and testing the control of assemblies. In addition, the winterizing of radar stations involves certain precautions with regard to hermetic sealing, heating and the protection of apparatus from moisture and snow. Author

N71-15462# Institute for Nuclear Physics Research, Amsterdam (Netherlands).
STATUS OF THE PROPOSAL FOR A HIGH INTENSITY LINEAR ELECTRON ACCELERATOR WITH A HIGH DUTY CYCLE AND WITH MAXIMUM ENERGY OF 500 MeV
P. J. T. Bruinsma, J. Haimson, and C. de Vries Oct. 1970 17 p refs Presented at the Electron Scattering and Nucl. Struct. Conf., Sardinia, 6 – 18 Sep. 1970 Submitted for publication
(Rept-70/8) Avail: NTIS

Justification is submitted for building a high intensity linear accelerator in Amsterdam (Netherlands). Technical developments for the machine design include: power klystrons, beam parameters, injector linear, rectangular waveguide structure, RF driver, modulators, and beam switchyard. Design studies are also in progress for vacuum systems, cooling systems, power stations, beam monitoring, general control, and buildings. E.M.C.

N71-15495# Idaho Nuclear Corp., Idaho Falls.
QUALIFICATION OF UMPIRE LABORATORIES FOR THE ANALYSIS OF URANIUM AND PLUTONIUM MATERIALS. REPORT 9: SECOND REPORT ON URANYL NITRATE
F. H. Tingey, B. J. Balkovetz, D. M. Lund, B. C. Musgrave, F. W. Spraktes et al Jul. 1970 8 p refs
(Contract AT(10-1)-1230)
(TID-25510) Avail: NTIS

A program was undertaken to determine the qualifications of U.S. commercial and foreign laboratories to serve as umpires in AEC transactions involving plutonium and uranium materials. The initial report on the precision and accuracy of uranyl nitrate tests done in qualified laboratories was published in 1968. Since then, two more laboratories have submitted results which were statistically evaluated in the same manner as those previously reported. Tabulated data which summarize the results of the precision and accuracy tests on all data submitted by July 1970 are presented. NSA

N71-15579# General Accounting Office, Washington, D.C.
IMPROVED ACCOUNTING CONTROL OVER EQUIPMENT AT THE KENNEDY SPACE CENTER, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION Report to the Congress by the Comptroller General of the United States
Elmer B. Staats 11 Aug. 1970 42 p refs
(B-169658) Avail: Issuing Activity

A review was made of the accounting procedures at Cape Kennedy Space Center to determine if the Center had adequate control over some of its equipment. It was recommended that procedures be amended and include the following: (1) Physical inventories be taken or supervised by someone other than the custodian of the equipment being counted. (2) Physical inventories be taken by counting all equipment in a given area rather than by using listings of equipment. (3) Complete physical inventories be taken at least once every three years. (4) Survey reports for missing or damaged equipment be promptly prepared and processed. Author

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N71-14713# General Electric Co., Schenectady, N.Y. Knolls Atomic Power Lab.
DETERMINATION OF TRANSIENT CHARACTERISTICS OF AN X-RAY VOID MEASUREMENT SYSTEM FOR USE IN STUDIES OF TWO-PHASE FLOW
O. C. Jones, Jr. Feb. 1970 11 p refs
(Contract W-31-109-eng-52)
(KAPL-3859) Avail: NTIS

A steady-state X-ray system was modified for use in determining transient variations in void fraction in two-phase, gas-liquid flow. The capabilities of this system are reviewed and discussed from both a void level and fluctuation frequency standpoint. Author (NSA)

N71-14737# Texas Univ., Austin. Electronics Research Center.
SOME STRUCTURAL PROPERTIES OF GENERALIZED AUTOMATA AND ALGEBRAS
Raymond T. Yeh 30 Apr. 1970 27 p refs
(Grants AF-AFOSR-1792-69; NSF GJ-786)
(AD-712377; TR-87; AFOSR-70-1548TR) Avail: NTIS CSCL 6/4

The paper studies the structure of generalized automata via their corresponding substitution algebras and semigroups. It is shown that certain substitution algebras corresponding to a generalized automata are embedded into the endomorphism semigroup of the automata. The author has characterized the family of congruence relations on a generic algebra which are also congruence relations on the corresponding substitution algebra. Author (TAB)

N71-14739*# Aerotherm Corp., Mountain View, Calif.
A NONSIMILAR SOLUTION FOR LAMINAR AND TURBULENT BOUNDARY LAYER FLOWS INCLUDING ENTROPY LAYERS AND TRANSVERSE CURVATURE Final Report
Ronald D. Grose and Robert M. Kendall Jun. 1970 93 p refs
(Contract NAS2-5829)
(NASA-CR-73481; Rept-70-14) Avail: NTIS CSCL 20D

A mathematical model of a nonsimilar laminar or turbulent boundary layer flow including entropy layer and transverse curvature effects is presented, and a method of solution is given. In the analysis, a turbulent model is described which employs a mixing length model for eddy viscosity in the wall region with consideration of injection or suction effects. The wake region eddy viscosity is taken to be proportional to the free stream velocity and local velocity defect thickness and includes an intermittency factor. Transverse curvature effects are also incorporated. A modification of the Levy-Lees transformation is used to transform the equations of motion to the (xi,eta) coordinate plane, where the conservation equations are integrated across boundary layer strips. Derivatives in the normal direction are related to one another by Taylor series truncated to reflect a quadratic or cubic approximation, and streamwise derivatives are expressed in finite difference form. The resultant set of equations is solved by general Newton-Raphson iteration. Author

N71-14748 Alabama Univ., University.
INVISCID HYPERSONIC FLOW OF CHEMICALLY RELAXING AIR ABOUT POINTED CIRCULAR CONES

Juergen Thoenes (Ph.D. Thesis) 1969 153 p
Avail: Univ. Microfilms: HC $7.20/Microfilm $3.00 Order No. 70-1409

A detailed discussion of the polynomial approximations employed in the integral method, the introduction of a characteristic relaxation length defined in terms of the initial species mass fraction gradients, as well as many results for hypersonic flow of air with finite rate nonequilibrium dissociation about circular cones are reported. The analysis of a cone with constant semi-vertex angle and free stream velocity at three different altitudes is used to demonstrate the validity and range of the nonequilibrium scaling law. The asymptotic equilibrium state of the non-equilibrium flow is compared with the results of a conical equilibrium flow calculation. According to theoretical considerations an agreement between the two cannot be expected, and this is confirmed by the comparison. Although the cone surface pressures agree very closely, it is found that the values for the asymptotic body surface temperature are higher than those for conical equilibrium. Dissert. Abstr.

N71-14749*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FORCES DUE TO AIR AND HELIUM JETS IMPINGING NORMAL TO A FLAT PLATE FOR NEAR-VACUUM AND SEA-LEVEL AMBIENT PRESSURES
Sherwood Hoffman and Joseph J. Janos Washington Jan. 1971 23 p refs
(NASA-TN-D-7002; L-7373) Avail: NTIS CSCL 20D

An investigation was conducted in the 12.5-meter-diameter vacuum sphere to determine the loads produced by air and helium jets impinging normal to a flat plate at ambient pressures of 0.0005 torr, 225 torr, and 760 torr. The far-field loads were nearly constant for each nozzle tested and were about 40 percent greater than the gross thrust of the nozzles (without spillage off the plate) under near-vacuum conditions. Near-field and zero-height loads were dependent on nozzle exit area and nozzle chamber pressure; therefore, they were very high for the hypersonic nozzles. The maximum touchdown load was 60 times greater than the thrust for the Mach number 12 helium nozzle in a near vacuum. Author

N71-14750# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
RESEARCHES ON THE PROPAGATION AND DECAY OF VORTEX RINGS Final Report
Gary M. Johnson Jun. 1970 51 p refs
(AD-713705; ARL-70-0093) Avail: NTIS CSCL 20/4

The propagation of vortex rings in air was studied via stroboscopic photography and hot-wire anemometry. Measurements of vortex time of flight, axial velocity distribution, and geometry were made. Empirical formulas are developed and compared with the existing theories. It is found that the linear momentum of vortex rings is conserved and that the ratio of vortex ring radius to core radius is approximately constant. Author (TAB)

N71-14757# Atomic Energy of Canada, Ltd., Chalk River (Ontario).
ANNULAR-DISPERSED TWO-PHASE FLOW AND CRITICAL HEAT FLUX
E. O. Moeck (Ph.D. Thesis—McGill Univ.) May 1970 337 p refs
(AECL-3656) Avail: NTIS; Atomic Energy of Can., Ltd., Chalk River, $7.00

Liquid film flow rates and critical heat fluxes were measured in a concentric, internally heated annulus in which steam and water flowed upwards at pressures and velocities of interest in nuclear reactors. Film growth rates were obtained from measurements of film flows on an unheated surface down-stream of the heater. From these, droplet deposition fluxes were calculated and an equation for the entrainment flux is proposed. A theoretical expression for droplet velocity, obtained from droplet interchange between film and core, was linked with a critical Weber number to predict maximum stable drop diameters. These agreed with available data. A variable density film model, coupled with the core model, gave acceptable predictions of film thicknesses and crest velocities in air-water flow. Author (NSA)

N71-14765*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL STUDY OF EFFECTS OF LAMINAR BOUNDARY LAYERS ON CHEMICAL-KINETIC MEASUREMENTS IN A SHOCK TUBE
T. A. Brabbs and F. E. Belles [1970] 11 p refs Proposed for presentation at 8th Intern. Shock Tube Symp., London, 5–8 Jul. 1971
(NASA-TM-X-52950; E-6113) Avail: NTIS CSCL 20D

Rate constants for the reaction H + O2 yields OH + O were deduced from shock tube measurements obtained in the presence of completely laminar boundary layers. The need for boundary layer corrections and the proper method of applying them were shown by comparing these rate constants with a standard line based on data determined previously in the presence of wholly turbulent boundary layers. The classical shock tube treatment illustrated the need for applying some type of boundary layer correction. The corrections were applied by means of a computer program for a subsonic diffuser, where the area ratio was described by Mirels' equation. These results were very satisfying as they showed excellent agreement with the assumed standard line. A revised value of the rate constant for the reaction is reported. It is 1.38 x 10 to the 14th power exp. −16400/RT. Author

N71-14766 Delaware Univ., Newark.
TURBULENCE INVESTIGATIONS WITH THE HELP OF A CONSTANT TEMPERATURE HOT WIRE ANEMOMETER
Harold C. Rias (Ph.D. Thesis) 1951 215 p
Avail: Univ. Microfilms: HC $9.70/Microfilm $3.00 Order No. 70-296

The flow system provides a flat velocity profile and a fractional turbulence of the order of 0.4% at the entrance to the test section. The development of a spot welding technique for welding fine tungsten wires to probe supports, a new electrical high frequency method for calibration of the hot wire anemometer, and a new type of nonlinear stage are described. The intensity of turbulence at the center of a round pipe was found to vary slightly with the Reynolds number. The accuracy is considered better than 3%. Measurements have also been made of the profiles of velocity and intensity of turbulence of a free jet issuing from a rectangular nozzle for the cases of streamlined flow and highly turbulent flow through the nozzle. The turbulence was created by placing a coarse screen just upstream of the mouth of the nozzle. Similar experiments were conducted for air streams flowing inside a rectangular duct. With the constant temperature anemometer it was possible to make measurements close to the screen. Dissert. Abstr.

N71-14767 Purdue Univ., Lafayette, Ind.
AN EXPERIMENTAL INVESTIGATION OF BOUNDARY LAYER DEVELOPMENT AND SWIRLING FLOW IN CONICAL DIFFUSERS
Robert Vernon Van Dewoestine 1969 197 p
Avail: Univ. Microfilms: HC $9.00/Microfilm $3.00 Order No. 70-3992

Two separate areas of flow in conical diffusers were investigated. For straight inlet flow, profiles of axial velocity were measured along the axes of conical diffusers. The velocities were measured by long time averaging of a hot-wire anemometer output signal. For 2-phi < or = 6 deg diffusers the profiles were correlated with the universal turbulent velocity profile. The distribution of

static pressure along the centerline of the diffusers was also measured. The performance of conical diffusers with swirling inlet flow was evaluated. The performance was determined from profiles of velocity and static pressure as measured at the diffuser inlet and exit using a five hole probe. Swirl rates with 9, 13, and 22 degrees maximum swirl angle were used. Swirling diffuser inlet flow did not adversely affect diffuser performance. For diffusers which exhibited separation with axial inlet flow, swirl reduced separation and correspondingly increased performance. Dissert. Abstr.

N71-14768 California Inst. of Tech., Pasadena.
VELOCITY MEASUREMENTS AHEAD OF A SEMI-INFINITE BODY IN MAGNETO-HYDRODYNAMIC FLOW WITH ALIGNED FIELDS
Bruce Meno Lake (Ph.D. Thesis) 1969 84 p
Avail: Univ. Microfilms: HC $4.40/Microfilm $3.00 Order No. 70-560

Experiments are described in which velocities were measured ahead of a semi-infinite Rankine body moving parallel to a uniform magnetic field in a conducting fluid. The flow disturbance in front of the body is found to increase in length as the square root of N, where N is the interaction parameter. In most of the experiments this parameter was varied from 4 to about 50. Measurements made along the axis of symmetry in the flow show that there is a relatively short region of stagnant fluid directly ahead of the body. The major part of the disturbance is found to consist of a much longer region in which the flow undergoes transition from conditions in the freestream to conditions near the body. Velocity profiles across the flow in this region show that for increased N, at a fixed distance ahead of the body, the velocity defect increases and the disturbance becomes more confined radially. Although the radial gradients in the flow increase with N, they are found to be much smaller than would be expected in a flow containing thin current layers. Dissert. Abstr.

N71-14769 California Inst. of Tech., Pasadena.
CONVECTIVE THERMAL TRANSFER IN A STEADY, NEARLY UNIFORM FLOW OF AIR BETWEEN PARALLEL PLATES. PART 1. A STUDY OF ORGAN-PIPE COMBUSTION OSCILLATIONS OF PREMIXED GASES IN A COMBUSTOR WITH VARIABLE LENGTH AT ATMOSPHERIC PRESSURE. PART 2
Wu-sun Chia (Ph.D. Thesis) 1969 200 p
Avail: Univ. Microfilms: HC $9.00/Microfilm $3.00 Order No. 70-567

Measurements of the total viscosity and total conductivity were made as a function of position and Reynolds number for the flow of air between two parallel plates with a separation of approximately 0.75 in. The temperature of the upper plate was 130.0 F and that of the lower plate 70.0 F. The investigations were carried out at Reynolds numbers from 40,000 to 100,000. The results obtained indicate little change in the total Prandtl number with increasing Reynolds number from the value of the molecular Prandtl number. The effect of varying the length of the combustor upon the frequency and the amplitude of the organ-pipe oscillations was investigated in a cylindrical combustor 3.836 in. in diameter and approximately 162 in. in length. Measurements of the perturbations in pressure were made in a premixed flame of air and natural gas at a mixture ratio of about 90 per cent stoichiometric. Results indicate some discontinuous variations in frequency, along with the presence of some quiet regions, as the length of the combustor is systematically changed. Dissert. Abstr.

N71-14771 University of Southern Calif. Los Angeles.
ARRHENIUS REACTING, ONE-DIMENSIONAL FLOWS WITH EQUILIBRIUM AND NON-EQUILIBRIUM INITIAL CONDITIONS
John William Barnes, Jr. (Ph.D. Thesis) 1969 138 p
Avail: Univ. Microfilms: HC $6.60/Microfilm $3.00 Order No. 70-340

One-dimensional flow of a dissociating gas is examined noting the fact that the ratio of a suitable reference temperature and the characteristic dissociation temperature is usually a small number epsilon, and that its appearance in the exponential Arrhenius factor makes the rate equation very sensitive to small changes in temperature. In fact, over a temperature range of 0 (epsilon) the dissociation term can vary from exponentially large to exponentially small. This derives the flow into a number of distinct region on layers of various widths. Each of these are analyzed using asymptotic expansion methods, and the solutions are matched to their neighboring regions in the normal manner. Dissert Abstr.

N71-14772 George Washington Univ., Washington, D.C.
RADIATING INVISCID FLOW BEHIND A PARABOLOIDAL SHOCK WAVE
Charles Noel Adkins (Ph.D. Thesis) 1969 72 p
Avail: Univ. Microfilms: HC $4.00/Microfilm $3.00 Order No. 69-21923

A method is presented for obtaining numerical solutions to the problem of axisymmetric radiating flow behind a paraboloidal shock in the hypersonic stream of an ideal inviscid gas. The effect of radiation is treated by use of the differential approximation for a grey gas, neglecting scattering and the direct contribution of radiation to pressure and internal energy. The method of series truncation is used to obtain first- and second-order solutions. These solutions involve mixed boundary conditions for the radiation variables, and special attention is given to obtaining transformations which have adequate rates of convergence for these variables. Examples for the strong-shock approximation are given for zero to moderate strength of radiation. Comparisons are made with published solutions for radiating and non-radiating flows, and close agreement is found with these results with marked improvement in accuracy for the radiation cases using the present method. Dissert. Abstr.

N71-14773 Houston Univ., Tex.
ON THE STABILITY OF POISEUILLE PIPE FLOW
Henry Johnston Crowder (Ph.D. Thesis) 1969 151 p
Avail: Univ. Microfilms: HC $7.20/Microfilm $3.00 Order No. 70-4493

The problem of the stability of Poiseuille pipe flow was studied numerically. The finite-difference equations which were solved are approximations to the nonlinear, axisymmetric, Navier-Stokes equations in cylindrical coordinates subject to a stream function perturbation. The disturbance to the stream function which was used is axisymmetric, oscillatory and fixed in space. The resulting solutions show the experimentally observed instability of the stream function and vorticity at Reynolds numbers of 10,000 and 100,000. The experimentally observed stability at a Reynolds number of 1,000 is also found. Dissert. Abstr.

N71-14808*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BOUNDARY LAYER MEASUREMENTS IN AN ACCELERATED FLOW WITH AND WITHOUT HEAT TRANSFER
Howard L. Wesoky and Charlene May. Washington NASA Jan. 1971 47 p refs
(NASA-TN-D-7030; E-5674) Avail: NTIS 20D

Experimental velocity and temperature profiles for the adiabatic and cooled boundary layers on a cylindrical body in an accelerated flow have been presented for a range of free-stream Mach numbers from 0.21 to 0.97. High acceleration caused thinning of the momentum boundary layer, but cooling the same boundary layer

increased the velocity and momentum thicknesses over the corresponding adiabatic values. Growth of the thermal boundary layer far outside the momentum boundary layer was also caused by high acceleration. Use of a standard mixing length hypothesis in integration of the boundary layer equations yielded fairly accurate predictions of the boundary-layer thickness. Author

N71-14808# Army Advanced Ballistic Missile Defense Agency, Huntsville, Ala.

AN INVESTIGATION OF THE DYNAMIC PRESSURE RESPONSE OF FLUERIC TRANSMISSION LINES

Larry C. Athe 1970 14 p refs

(AD-713505) Avail: NTIS CSCL 13/7

The scope of the investigation can be summarized in three parts: (1) An examination and review of pertinent literature; (2) The development of a mathematical model of a flueric transmission line suitable for use by a design engineer; and (3) The experimental determination of the dynamic response of flueric transmission lines over a wide frequency range with subsequent verification of the mathematical model. Author (TAB)

N71-14815 Michigan Univ., Ann Arbor.

OBSERVATIONS AND ANALYSES OF CAVITATING FLOW IN VENTURI SYSTEMS

David Martin Ericson, Jr. (Ph.D. Thesis) 1969 288 p

Avail: Univ. Microfilms: HC $13.05/Microfilm $3.70 Order No. 70-4074

Using water and mercury as the working fluids cavitation was observed in plastic and stainless steel venturis with throat diameters 1/8 to 3/4 inch, a throat length to diameter ratio of 4.6, and 6 deg included angle inlet and diffuser sections. The data was treated using a linear regression analysis which permits a wide latitude in the form of the independent variable. It was not possible to generate a predicting equation based simply on measurement of the physical parameters of the system. Nevertheless, the work shows that water and mercury cavitation are heavily influenced by the permanent gas present and that both Reynolds number and Weber number effects must be included. Thermodynamic effects were much less important over the temperature ranges available. Further, it is deduced that local flow disturbances triggered by surface imperfections have a strong impact upon the cavitation characteristics of the venturis. Dissert Abstr.

N71-14851*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

UNDISTORTED INLET FLOW TESTING. EVALUATION OF RANGE AND DISTORTION TOLERANCE FOR HIGH MACH NUMBER TRANSONIC FAN STAGES, VOLUME 1 Task 2 Stage Data and Performance Report

K. R. Bilwakesh Jan. 1971 205 p refs

(Contract NAS3-11157)

(NASA-CR-72778-Vol-1; GE-R70-AEG-427-Vol-1) Avail: NTIS CSCL 20D

A compressor stage consisting of a 1500 ft/sec tip speed rotor, a variable-camber inlet guide vane, and an adjustable stator, was tested with undistorted inlet flow at several inlet guide vane and stator settings. The objectives of the tests were to obtain blade element data and to evaluate the effectiveness of the variable geometry blading at several key points in an operating envelope typical of a Mach 3 turbofan engine. The overall performance and the blade element data obtained at the three combinations of IGV-stator settings at 50, 70, 80, 90, 100, and 110 percent design speed are presented in two volumes. Details of the test equipment, test procedure, data reduction methods, overall performance data and plots of blade element data are presented. Author

N71-14852*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

UNDISTORTED INLET FLOW TESTING. EVALUATION OF RANGE AND DISTORTION TOLERANCE FOR HIGH MACH NUMBER TRANSONIC FAN STAGES, VOLUME 2 Task 2 Stage Data and Performance Report

K. R. Bilwakesh Jan. 1971 290 p

(Contract NAS3-11157)

(NASA-CR-72787-Vol-2; GE-R70-AEG-421-Vol-2) Avail: NTIS CSCL 20D

The overall performance data and tabulations of blade element data obtained from tests of turbofan blade elements operating at Mach 3 are presented. The data were obtained for stator schedules of 50, 80, 90, 100, and 110 percent of design speed. Author

N71-14855# Wisconsin Univ., Madison. Mathematics Research Center.

WAKE CURVATURE AND THE KUTTA CONDITION

D. A. Spence Dec. 1969 26 p

(Contract DA-31-124-ARO(D)-462)

(AD-713436; MRC-TSR-1033) Avail: NTIS CSCL 20/4

The outer potential problem for attached flow at incidence past a thin flat plate is set up with a vortex sheet to represent the wake, leading to a singular integro-differential equation for the mean slope of this sheet. Solution yields a correction to the Kutta Joukowski circulation. Author (TAB)

N71-14863*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

INLET FLOW DISTORTION TESTING. EVALUATION OF RANGE AND DISTORTION TOLERANCE FOR HIGH MACH NUMBER TRANSONIC FAN STAGES, VOLUME 1 Task 2 Stage Data and Performance Report

W. A. Tesch and V. L. Doyle Jan. 1971 125 p refs

(Contract NAS3-11157)

(NASA-CR-72786-Vol-1; GE-R70-AEG-426-Vol-1) Avail: NTIS CSCL 20D

A variable geometry stage consisting of a 1500 ft/sec tip speed, medium aspect ratio rotor, a variable camber inlet guide vane and a variable-stagger stator was tested under conditions of tip radial and 90 deg one-per-rev circumferential distorted inlet flow. Overall performance and stall limits were determined for each inlet condition at 70%, 90% and 100% of design speed. Extensive surveys of flow conditions were made for the case of circumferential distortion. In addition, blade element data were obtained when testing with radial distortion. Inlet distortion test results are presented and discussed. Author

N71-14864*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

INLET FLOW DISTORTION TESTING. EVALUATION OF RANGE AND DISTORTION TOLERANCE FOR HIGH MACH NUMBER TRANSONIC FAN STAGES, VOLUME 2 Task 2 Stage Data and Performance Report

W. A. Tesch and V. L. Doyle Jan. 1971 104 p

(Contract NAS3-11157)

(NASA-CR-72786-Vol-2; GE-R70-AEG-426-Vol-2) Avail: NTIS CSCL 20D

For abstract, see N71-14863.

N71-14891# Virginia Univ., Charlottesville. Research Labs. for the Engineering Sciences.

THE MEASUREMENT OF SPHERE DRAG IN RAREFIED GAS USING A MAGNETIC WIND TUNNEL BALANCE Final Report

W. M. Phillips, A. G. Keel, Jr., and A. R. Kuhlthau Arlington, Va. AFOSR Apr. 1970 70 p refs

(Contract AF-AFOSR-1046-67)

(AD-712741; AEEP-3435-115-70U; AFOSR-70-1588TR) Avail:

NTIS CSCL 20/4

Drag measurements on spheres in high speed transition regime flow are presented. The spheres are suspended electromagnetically in the low density flow field from a jet expanding freely from a small sonic nozzle into a vacuum. This arrangement provides sting-free measurements under hypersonic conditions. The current in the control coil of the electromagnetic balance is proportional to the applied force and provides a sensitive determination of the small forces encountered. Data were taken using nitrogen and argon gases. A number of nozzle and sphere sizes were employed covering a Knudsen number range of 0.05 to 5. The results exhibit a smooth increase in the transition regime drag coefficient toward the free molecular limit for diffuse reflection and complete thermal accommodation. Comparison is made with the available experimental results of other techniques. Improved repeatability and an extension of range of flow parameters is obtained with the present methods. The data are compared with current near-free molecular flow theories and the modified Krook solution of Willis is found to give the best agreement with the experimental results. Author (TAB)

N71-14892# National Bureau of Standards, Washington, D.C.

INTERNAL WAVES PRODUCED BY SPHERES MOVING IN DENSITY STRATIFIED WATER

Karl Lofquist 1970 87 p refs

(AD-712442; NBS-10267) Avail: NTIS CSCL 20/4

The report contains experimental observations and a theoretical study of the lee waves behind a sphere moving with constant horizontal velocity through a stably stratified liquid. The density decrease with height is nearly linear in the region of sensible waves. The observations were made in a tank of stratified salt water. In dimensionless plots, the vertical displacement is given as function of position behind the sphere and of the spheres size and speed. Over much of their range, the displacements were noticeably affected by the horizontal boundaries of the stratified region, which were non rigid interfaces. The theory is approximate and applies only to the case of an unbounded fluid. However, it does not require the assumption of a low profile disturbance and also avoids anomalies found to be associated with a doublet disturbance. The nature of the disturbance and its effect upon the waves are embodied in a function, G, contained in the solution, which includes the doublet model as a special case. This function cannot exactly satisfy, nor be determined by, the condition of no flow through the surface of the sphere. However, a suitable form of G is derived empirically from a part of the observations. The region of direct comparability between observations and theory is limited by the disparity in their outer boundary conditions. As far as comparison can be extended, the observations and theory are reasonably compatible. Author (TAB)

N71-14907# Bettis Atomic Power Lab., West Mifflin, Pa.

FUNDAMENTAL EQUATIONS OF TWO-PHASE FLOW. PART 1: GENERAL EQUATIONS OF CONSERVATION

Jean-Mark Delhaye 1970 99 p refs Transl. into ENGLISH from a French Report Prepared by Sci. Transl. Service for Bettis Atomic Power Lab.

(PB-193989; WAPD-Trans-0128-Pt-1) Avail: NTIS CSCL 20D

The main object was to apply the equations of conservation to two phase liquid-gas systems. The equations are quite general and not the object of any hypothesis concerning the nature of phases present. However, certain conclusions have the mark of liquid-gas or liquid-vapor flows. Several types of equations are formulated. If the dispersed phase is locally in an extremely divided state, i.e., if the percentage of the dispersed phase can be locally defined in an elementary volume of the mixture, then one will have a mechanics of emulsions or suspensions which constitutes a special case of the mechanics of two-phase flow. USGRDR

N71-14928# Princeton Univ., N.J.

STUDY OF TURBULENT BOUNDARY LAYER MODELS. PART 2: MEAN TURBULENT FIELD CLOSURE Final Report, May 1970

George L. Mellor and H. James Herring 1970 55 p Sponsored by AEC Prepared for Sandia Corp., Albuquerque

(SC-CR-70-6125-Pt-2) Avail: NTIS

In order to close the mean velocity equations appeal is made to the mean turbulent equations of motion obtained by taking the first moment (in velocity) of the Navier-Stokes equations. To close the resulting equation set, assumptions are required, the consequence of which has been labeled mean turbulent field closure. Whenever possible, an attempt at supplying a rational basis for each assumption is made. In any event, the central hypothesis is that already proposed by Rotta. Various simplified sub-models may be identified including mean velocity field closure. Author

N71-14934# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.

INTERACTION OF A SPHERICAL SOURCE FLOW WITH A RAREFIED ATMOSPHERE

J. W. Brook and B. B. Hamel (City Coll. of N.Y.) Lafayette, Ind. Purdue Univ. Sep. 1970 14 p refs Prepared for Purdue Univ.

(Contract N00014-67-A-0226-0005; Proj. Squid)

(AD-713122; SQUID-TR-CCNY-1-PU) Avail: NTIS CSCL 20/4

The interaction of a hypersonic spherical source flow with a rarefied background is solved using a model Boltzmann equation employing a three fluid description. Matched asymptotic expansions of the variables in inner (background scattering) and outer (jet scattering) regions are employed and the zeroth order composite solution found. Author (TAB)

N71-14969# Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics.

A LABORATORY INVESTIGATION OF TURBULENCE IN STRATIFIED SHEARING FLOW

Michael J. Moore and Robert R. Long Jul. 1970 105 p refs

(Grant ESSA-E22-36-70/G/)

(PB-193238; TR-2-Ser-K) Avail: NTIS CSCL 20D

Some experiments are described in which steady state shearing flows are developed in stratified brine solutions contained in a cyclically continuous tank of rectangular cross section. Over the range of overall Richardson numbers studied, the results show that whenever turbulent layers are present on either side of a region of fluid with a gravitationally stable density gradient, they cause erosion of this region to occur. The erosion leads to the formation of two homogeneous layers separated by a thin layer of strong density and velocity gradients. The gradient Richardson number, computed by using the velocity and density gradients in this transition layer, tends to have a value of order one. Author (USGRDR)

N71-14970*# Aztec School of Languages, Inc., Maynard, Mass. Research Translation Div.

DYNAMIC SELF-FOLDING AND SELF-WINDING PROCESSES (VORTICES) IN VISCOUS FLUIDS [LES AUTOPLISSEMENTS ET LES AUTO-ENROULEMENTS DYNAMIQUES DANS LES FLUIDES A VISCOSITE]

Francois-Joseph Bourriares Washington NASA Dec. 1968 15 p refs Transl. into ENGLISH of Min. de l'Air, Paris, report TR-83

(Contract NASw-1692)

(NASA-TT-F-12588; TR-83) Avail: NTIS CSCL 20D

Equations of viscosity are used to study the vortices which frequently accompany the regular self-folding processes of a jet, wake, or wedge. The analysis applies general classical equations to the permanent, two dimensional motion of viscous fluids, using the intrinsic form. The explicit presence of the radius of curvature in

this form is completely adapted to the representation of various sinusoids or spirals. The concept of fluid motions with a constant velocity sheet (analogous to the concept of fibers in material resistance) leads to infinitesimal analytical calculations which are particularly simple. Author

N71-14971# Bettis Atomic Power Lab., West Mifflin, Pa.
FUNDAMENTAL EQUATIONS OF TWO-PHASE FLOW. PART 2: ADDITIONS AND REMARKS
Jean-Marc Delhaye 1970 67 p refs Transl. into ENGLISH from French Report CEA-R-3429 Prepared by Sci. Transl. Serv., Ann Arbor, Mich. for Bettis Atomic Power Lab., West Mifflin, Pa.
(PB-193988T; WAPD-Trans-0129-Pt-2; CEA-R-3429-Pt-2) Avail: NTIS CSCL 20D

The report introduces the terms corresponding to interfacial tension into the general equations. Thus, the interface conditions have been generalized. An additional step must be taken: it was in fact impossible to take interfacial tension into account in the case of emulsions. One has a system of equations for each model of two-phase flow but it must not be forgotten that in the majority of cases, turbulence is added to the random character of the presence of a given phase at a given point and time. In fact, there is a double probability, whose properties will have to be sought in the same way as in single-phase flow it was necessary to propose statistical laws and attempt to formulate the equations by introducing a fictional turbulence viscosity. USGRDR

N71-14972*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A CRITICAL EVALUATION OF ANALYTIC METHODS FOR PREDICTING LAMINAR BOUNDARY-LAYER SHOCK-WAVE INTERACTION
John D. Murphy Washington Jan. 1971 28 p refs
(NASA-TN-D-7044; A-3713) Avail: NTIS CSCL 20D

Three analytic methods for describing the observed interaction phenomena are discussed, and results obtained with these methods are compared with selected experimental data. It is shown that the presently available theoretical methods are in essential agreement with each other at all flow conditions considered. The predictions agree with experimental data for weak shock waves at low Mach numbers, but not for strong shock waves at hypersonic speeds. Author

N71-14978# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
POLYELECTROLYTES IN SOLUTION: THEIR CONFORMATION AND TURBULENT FLOW CHARACTERISTICS
William B. Clarke (Ph.D. Thesis) 2 Oct. 1970 30 p refs
(Contract NONR-3963(10))
(AD-713217) Avail: NTIS CSCL 20/4

A slightly ionic and a highly ionic polymer of molecular weights about 8000000 were studied in dilute solution. The molecular conformation was studied by intrinsic viscosity and light scattering to find the molecular weight and radius of gyration. The flow characteristics were studied in a 1.031 cm ID pipe. Salt was added to the solutions in order to change the conformation of the polymers. The polyelectrolytes were good drag-reducers, and behaved similarly to non-ionic polymers. In the presence of salt the slightly ionic polymer showed values of the onset and extent of drag reduction parameters which would be expected for the molecular weight and conformation. For the highly ionic polymer the extent parameter was slightly less than expected. When dissolved in distilled water both polymers followed the maximum drag reduction asymptote, with no onset point. However, at low concentrations the flow lines for the highly ionic polymer lay between the MDR asymptote and the Prandtl line. Author (TAB)

N71-14979# California Univ., Berkeley. Div. of Aeronautical Sciences.
AN INTEGRAL EQUATION FOR UNSTEADY SURFACE WAVES AND A COMMENT ON THE BOUSSINESQ EQUATION
John G. B. Byatt-Smith Jun. 1970 24 p refs
(Contract N00014-69-A-0200-1020)
(AD-713107; AS-70-7) Avail: NTIS CSCL 20/4

An exact integral equation for unsteady inviscid surface waves is derived. Existing known approximations are all derived from the one equation. The Boussinesq equation is obtained and criticized. Author (TAB)

N71-14990# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Div.
PRODUCTION OF FLUIDISTORS BY CHEMICAL MILLING [TILLVERKNING AV FLUIDISTORER GENOM KEMISK FRAESNING]
Goeran Lundstroem May 1969 8 p In SWEDISH
(FK-69111) Avail: NTIS

The manufacturing process and construction methods for fluidistor laminates are described. Transl. by R.B.

N71-14993*# General Electric Co., Schenectady, N.Y. Research and Development Center.
FLOW AND ACOUSTIC CHARACTERISTICS OF SUBSONIC AND SUPERSONIC JETS FROM CONVERGENT NOZZLE
H. T. Nagamatsu, R. E. Sheer, Jr., and M. S. Gill Washington NASA Dec. 1970 110 p refs
(Contract NASw-1784)
(NASA-CR-1693) Avail: NTIS CSCL 20D

Convergent and parallel flow nozzles were used to study the flow and acoustic characteristics of subsonic and supersonic jets. For subsonic jets the core region extended 5 diameters from the jet exit and for a Mach number of 1.4 the sonic point was located at 13.7 diameters. The subsonic turbulent velocity decay region for both types of jets were similar. Peak impact pressure fluctuations on the axis occurred at approximately 9 diameters for subsonic jets and for supersonic jets the peak was located just ahead of the sonic point. Directivities for the subsonic jets were similar with the maximum sound pressure level at 19.1 deg from the jet axis and then decreasing with increasing angle. For supersonic jets the sound pressure level was nearly constant over most of the angular positions. The power spectra for subsonic jets were similar with the peak power occurring at 4 kHz. For a Mach 1.4 jet the peak power occurred at 5 kHz. Near field sound pressure level distributions were quite similar for subsonic jets, but for supersonic jets were quite different. Overall sound power levels were compared with the subsonic theory of Lighthill and supersonic theory of Nagamatsu and Horvay. Author

N71-15309*# Martin Marietta Corp., Denver, Colo.
THE UNSTEADY SURFACE PRESSURE AROUND CIRCULAR CYLINDERS IN TWO-DIMENSIONAL FLOW
Wayne E. Simon *In* NBS Windloads on Bldg. and Struct.' Nov. 1970 p 87–91 refs (See N71-15301 05-12)
(Contract NAS8-5322)
(NASA-CR-114132) Avail: NTIS; SOD $1.75 Catalog No. C-13.29/2:30 CSCL 20D

The unsteady surface pressure around circular cylinders in two-dimensional flow has been measured in the subcritical, supercritical, and transcritical flow regions. A representation of the crosspower spectral density has been developed which is a reasonable representation of the data and which applies to all three regions. The most important result is the essential similarity of the subcritical and transcritical regions. Author

N71-15485# Colorado State Univ., Fort Collins. Fluid Dynamics and Diffusion Lab.

AIR FLOW OVER ROUGHNESS DISCONTINUITY

Fei-Fan Yeh and E. C. Nickerson Jul. 1970 142 p refs

(Contract N00014-68-A-0493-0001; Proj. Themis)

(AD-712113; CER70-71FFY-ECN6; Themis-CER-TR-8) Avail: NTIS CSCL 20/4

Measurements of mean velocity, mean-square turbulent velocity, turbulent shear stress, one-dimensional spectrum, and mass concentration distributions following a step increase in surface roughness of a wind-tunnel boundary-layer flow are presented. The mean velocity distributions agree well with Nickersons numerical calculations for a small roughness change. The mixing-length distribution in the transitory region is not experimentally consistent with that established for fully-developed turbulent boundary layer. Turbulent intensity and shear stress are generated progressively towards the upper layer as one moves downstream from the roughness discontinuity. The high frequency end of the spectra in the transitory region can be exactly represented by the high frequency shape of the undisturbed turbulent boundary layer. Self-preserving mass concentration profiles are in general possible for both the vertical and horizontal distributions. The adjustment of the mean motion to the roughness change is more rapid than that of the turbulence. Author (TAB)

N71-15486# Illinois Univ., Urbana. Coordinated Science Lab.

NUMERICAL STUDIES OF SOLUTIONS OF THE KROOK EQUATION OF KINETIC THEORY

Barbara J. Reilly Sep. 1970 39 p refs

(Contracts DAAB07-67-C-0199; N00014-67-A-0305-0001)

(AD-712684; R-488; UILU-ENG-70-233) Avail: NTIS CSCL 7/4

Because of the difficulty encountered in evaluating the collision integral in the Boltzmann equation, it has been proposed to solve the nonequilibrium rarefied gas flow problems by using a substitute equation, namely the Krook equation which replaces the collision integral by a statistical (or relaxation) model. Even though the need to evaluate the complicated collision integral is eliminated in solving the Krook equation, the equation collision integral is eliminated in solving the Krook equation, the equation is still-non-linear and is still quite difficult to solve numerically. Error studies on the solutions of the Krook equation will give information on the errors in the solution of the Boltzmann equation because the solution algorithms are identical except for the different means of calculation of the collision integral. Because solutions to the Krook equation take much less time to compute, the systematic errors in the numerical method can be more accurately investigated. Four errors are studied, namely, those due to (1) the effect of the number of stations, (2) the effect of the variable of integration, (3) the effect of appropriate boundary conditions for the shock wave, and (4) the effect of a modification of the integration formula. TAB

N71-15488# Oakland Univ., Rochester, Mich.

SYNTHESIS OF TRANSFER FUNCTIONS USING RC FLUIDIC CIRCUITS

D. E. Boddy 1970 15 p refs Presented at 4th Crainfield Fluidics Conf., Coventry, England, 17-20 Mar. 1970 Sponsored in part by British Hydromechanics Res. Assoc.

(Grant NSF GK-1544)

(Rept-F3) Avail: Issuing Activity

The general problem of the synthesis of transfer functions with active RC fluidic circuits is examined. It is found that a broad class of rational transfer functions can be implemented. The approach taken here is to decompose the given transfer function into multiplicative factors, called transfer function elements. Circuits for synthesizing these elements are presented and analyzed to determine the implied restrictions. It is assumed that the highest frequencies of interest in the transfer function to be simulated are well below the bandwidth of the amplifiers such that the amplifiers may be assumed to have infinite bandwidth. Apparently any rational, finite transfer function having a numerator of order not greater than the order of the denominator and having only left-half-plane poles, can be synthesized by this method. Experimental results are presented which verify certain of the circuits presented. Author

N71-15487*# Techtran Corp., Glen Burnie, Md.

TWO-PHASE FLOW OF METAL VAPORS INTO A VACUUM [ZWEIPHASENSTROMUNGEN IN DAS VAKUUM MIT VERDAMPFUNG VON METALLEN]

Wolfgang Brunner Washington NASA Dec. 1969 111 p refs Transl. into ENGLISH of Tech. Hochschule Munchen dissertation, 1968 p 1-118

(Contract NASw-1695)

(NASA-TT-F-12690) Avail: NTIS CSCL 20D

Laboratory experiments were conducted to study the vaporization mechanism of metal clouds in the upper atmosphere. In these simulations, Ba-CuO mixtures with sodium nitrate additions were burned in reaction vessels of 50 cu cm volume. The reaction products passed through a convergent tungsten nozzle into a vacuum chamber of 20 cu m volume with an initial 0.000001 Torr. The attained reproductibility of combustion, ejection, and vaporization was such that reliable predictions were possible for vapor yield. In addition, the system permitted demohstration of the two phase flow with vaporization in the nozzle and in free flow. The resulting thermodynamic equilibrium was followed by evacuation, controlled by selecting a nozzle dimension which permitted termination of that process within approximately 200 ms. Pressure in the reaction vessel, thrust of the reaction vessel, barium vapor density at a distance of 50 cm from the nozzle, vapor distribution vertical to the jet axis, mean aerosol velocity, and aerosol distribution were measured. Author

N71-15538# California Univ., Livermore. Lawrence Radiation Lab.

FLAG: A FREE LAGRANGE METHOD FOR NUMERICALLY SIMULATING HYDRODYNAMIC FLOWS IN TWO DIMENSIONS

W. P. Crowley 28 Aug. 1970 28 p refs Presented at the 2d Intern. Conf. on Numerical Methods in Fluid Dyn., Sep. 1970 Submitted for publication Sponsored in part by AEC

(UCRL-72700; CONF-700906-2) Avail: NTIS

The violent fluid motions due to mesh distortion were simulated by traditional Lagrangian numerical techniques. This distortion was overcome in the FLAG method by permitting a mesh point to change neighbors automatically during the calculation. Neighbors were chosen on the basis of distance, and each mesh point may have a different number of nearest neighbors each time step. The FLAG method was applied to compressible as well as to incompressible flows; the results of an incompressible flow calculation were given. Author

N71-15540# Desert Test Center, Fort Douglas, Utah.

KINEMATICS OF DIFFUSION, FLUIDS AND PLASMA BY CONTINUOUS MOVEMENT AND FINITE VELOCITIES

Ronald E. Meyers 1970 15 p refs

(AD-713588) Avail: NTIS CSCL 20/4

Einstein, Chandrasekhar, and others using Markov processes have derived parabolic differential equations governing physical processes such as Brownian motion, diffusion, and stellar dynamics. Unfortunately, a mathematically admissable limiting process used in these derivations leads to infinite particle velocities. While Einstein and Chandrasekhar realized the drastic nature of the approximations employed in the parabolic formulation, there has been widespread indiscriminate use and generalization of their equations without regard to the fundamental limitations imposed by those approximations. It is believed that the following is the

framework of a general theory which provides a systematic, comprehensive, and useful approach to studying phenomena based on particulate motion. The present hyperbolic theory is a modification and generalization of a hyperbolic diffusion model and attempts to represent more accurately the physical process of diffusion.
Author (TAB)

N71-15548# National Aerospace Lab., Amsterdam (Netherlands).
SOME ANALYTICAL AND NUMERICAL CALCULATIONS FOR A CYLINDER-VORTEX COMBINATION IN INCOMPRESSIBLE FLOW
H. Kramer Jul. 1969 19 p refs
(NLR-TR-69057-U) Avail: NTIS

Velocity- and pressure-distributions over a circular cylinder crossed by a line vortex at right angles were determined by numerical evaluation of analytical expressions. The results are compared with numerical results of the panel method using a surface distribution of sources. Based on this comparison the influence of variations in the panel distribution on the accuracy of the numerical results was investigated.
Author

N71-15611# Research Inst. of National Defence, Stockholm (Sweden). Operations Research Center.
ESTIMATION OF FLOWS IN NETWORKS
Ove Frank Aug. 1969 44 p refs
(FOA-P-C-8237-13) Avail: NTIS CSCL 20D

A flow in a network is characterized by the flows along the arcs and the conditions of consistence at the nodes. Some arc flows may be known, some unknown but measured and uncertain owing to errors in measurement, and some completely unknown. Also the flows that are generated or absorbed at the nodes may be known, uncertain or unknown. In this paper a model of flow measurement is given, and it is shown how the estimation of the flows may be formulated as a linear estimation problem which may be solved for general networks. For some special types of networks simple algorithms are given.
Author

N71-15669# Royal Aircraft Establishment, Farnborough (England).
INVESTIGATIONS OF THE MASS EXCHANGE BETWEEN RECIRCULATION ZONES BEHIND AXIALLY SYMMETRICAL FLAME HOLDERS AND THE SURROUNDING FLOW [UNTERSUCHUNGEN UEBER DEN MASSENAUSTAUSCH ZWISCHEN RUCKSTROEMGEBIETEN HINTER ROTATIONSSYMMETRISCHEN FLAMMENHALTERN UND DER UMGEBENDEN STROEMUNG]
G. Winterfeld and E. G. Broadbent, ed. Jun. 1970 118 p refs
Transl. into ENGLISH from German report DLR FB 69-07
(RAE-LIB-TRANS-1418) Avail: NTIS

Considered are equations suitable for the description of the turbulent exchange process between the recirculation regions behind axisymmetric flame holders, and measurement techniques for the determination of mean residence times in the recirculation zones. Subsequently, the exchange processes and the measuring procedures are investigated theoretically by means of simplified models. The results of measurements on the mean residence time, and the size and shape of the recirculation regions are used to discuss the magnitude of mass exchange, and its modification through variation in the most important affecting quantities. Finally, the processes in the recirculation zone behind flame holders are investigated in relation to the stabilization of flames, taking account of the results of the exchange measurement.
Author

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N71-14659# Joint Publications Research Service, Washington, D.C.
OCEANOGRAPHY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 240 10 Nov. 1970 p 14-20 refs (See N71-14656 05-30)
Avail: NTIS

News items and research abstracts on the following topics are summarized: airborne infrared radiometer for surface temperature measurements; apparatus for simulating thermal convection in coriolis force field; interaction between the ocean and atmosphere; voyage to Vladivostok of weather research ship OKEAN; statistical distribution of pressure waves; turbulent exchange and heat flux in sea water near surface; vertical circulation in Norwegian and Greenland Seas; statistical structure of North Atlantic water temperature; thermohaline circulation in north Atlantic; hydrological conditions in northeast Atlantic straits; determination of microelements of heavy metals in Black Sea surface waters; vertical circulation of waters and distribution of hydrochemical elements; marine concentrators as sources of rare and disperse elements; and statistical analysis of sea temperature and surface heat balance.
E.C.

N71-14660# Joint Publications Research Service, Washington, D.C.
TERRESTRIAL GEOPHYSICS
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 240 10 Nov. 1970 p 21-24 refs (See N71-14656 05-30)
Avail: NTIS

News items and research abstracts on the following topics are summarized: prospects for locating underwater petroleum and gas deposits; Kungur earth tidal station operations; earthquake of magnitude four recorded at Tbilisi; paleoseismological method of determining regional seismicity; hydrogeological characteristics of western Pacific petroleum and gas zone.
E.C.

N71-14661# Joint Publications Research Service, Washington, D.C.
UPPER ATMOSPHERE AND SPACE RESEARCH
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 240 10 Nov. 1970 p 25-43 refs (See N71-14656 05-30)
Avail: NTIS

News items and abstracts on upper atmosphere and space research topics are summarized including: rocket launching site on Kheys Island, Franz Josef Land; Intercosmos satellite operations; launching of Zond 8; plasma ion engine tests; launching of Cosmos 300-series satellites; lunar and space observatory mission planning; meridional cross section of the ionosphere between Leningrad and Murmansk; electron concentration in F region during world magnetic storm; auroral absorption of radio waves in ionosphere; vertical wind in the ionosphere and geomagnetic variations; geomagnetic S sub D variations during solar activity cycle; ionization in semitransparent sporadic layers; radio wave absorption by E sub s layer; vertical movements in D region; and snowstorm radio noise in the range 7 to 20 Mc/sec.
E.C.

N71-14692# Little (Arthur D.), Inc., Cambridge, Mass.
RESEARCH ON DATA AND ANALYTICAL SYSTEMS FOR PREPARING NATIONAL WATER ASSESSMENTS Final Report
9 May 1970 350 p refs
(Contract DI-14-01-001-1982)
(PB-192118; W70-07326) Avail: NTIS CSCL 13B

Supply analysis incorporates precipitation, evapo-transpiration, surface storage, streamflow, infiltration, and groundwater storage. Demand analysis incorporates aggregate and point-source withdrawals, consumptive uses, return flows, channel uses, storage uses, inter-basin transfers and re-cycles. Quality analysis incorporates biochemical oxygen demand, thermal and dissolved-solids effluent loadings in receiving waters, pre- and post-use treatment, and instream quality dynamics in stream-segment models. The data

system was designed to guide organization for simulation. The analytical system defines program routines, subroutines and algorithms in text, charted program logic, and Fortran variables. USGRDR

N71-14693# Army Electronics Command, Fort Huachuca, Ariz. Atmospheric Sciences Lab.

A SIMILARITY MODEL FOR ATMOSPHERIC TURBULENCE STRUCTURE IN THE PLANETARY BOUNDARY LAYER

William D. Ohmstede 1970 14 p refs

(AD-713569) Avail: NTIS CSCL 4/1

The planetary boundary layer, the lowest 1000 meters of the atmosphere, is of special interest because most Army operations and materiel function within it. This layer of air is characteristically turbulent. This property not only affects the overall behavior of the layer, but also directly influences Army operations and materiel. Meaningful measurements of atmospheric turbulence are difficult to obtain, and techniques must be developed for assessing the turbulence structure from simple observations or, in some cases, no observations at all. The report discusses numerical solutions of energy and transport equations in the planetary boundary layer. TAB

N71-14694# Road Research Lab., Crowthorne (England). Earthworks and Foundations Section.

THE REPRODUCIBILITY OF THE RESULTS OF SOIL CLASSIFICATION AND COMPACTION TESTS

P. T. Sherwood 1970 55 p refs

(PB-194134; RRL-LR-339) Copyright Avail: NTIS CSCL 13B

The reproducibility of soil-classification and compaction test results was investigated. The reproducibility obtainable by one operator, operators within one laboratory, and operators in different laboratories was examined. The results show that repeatable values within an acceptable degree of accuracy could be obtained by one operator but the reproducibility within a laboratory and between laboratories was much larger than expected. Author (USGRDR)

N71-14695# California Univ., Livermore. Lawrence Radiation Lab.

MATHEMATICAL APPROACH TO THE INFLUENCE OF GEOLOGICAL FORMATIONS ON SEISMIC MOTIONS

Gerald A. Frazier (Calif. Inst. of Tech.) and John E. Roberts Jun. 1970 36 p refs Sponsored in part by AEC

(UCRL-50898) Avail: NTIS

A mathematical approach for analyzing the influence of geological formations on seismic motions was developed. The time-dependent behavior of the geological formations was obtained by a modal analysis in which the complexities of the formations can be treated on a time-independent basis. The amplification of sinusoidal motions by a single-layered alluvial plain was calculated as a simple illustrative examples. Author (NSA)

N71-14697# National Environmental Satellite Center, Washington, D.C.

ANNOTATED BIBLIOGRAPHY OF REPORTS, STUDIES, AND INVESTIGATION RELATING TO SATELLITE HYDROLOGY

D. R. Baker, A. F. Flanders, and M. Fleming Jul. 1970 32 p refs

(PB-194072; ESSA-TM-NESCTM-10) Avail: NTIS CSCL 13B

The bibliography is on applications of satellite data to hydrologic problems confronting ESSA's mission. Author (USGRDR)

N71-14698# Road Research Lab., Cronthorne (England). Earthworks and Foundations Section.

THE ANALYSIS OF CONSOLIDATION TEST DATA BY COMPUTER

R. T. Murray 1970 31 p refs

(PB-194036; RRL-LR-344) Avail: NTIS CSCL 13B

A computer program is described written in FORTRAN 4 language to evaluate the data from laboratory consolidation tests according to the conventional square-root-of-time and logarithm-of-time methods, but using analytical techniques which simulate the graphical treatment normally employed. A third method of evaluation, based on a process of successive approximation and therefore highly suited to computer evaluation, is also included in the program. Author (USGRDR)

N71-14700# Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.

LABORATORY INVESTIGATION OF WAVE-INDUCED MOTION ABOVE AIR-SEA INTERFACE

O. H. Shemdin and R. J. Lai Jul. 1970 101 p refs

(Contract DACW-72-69-C0019; Grant NSF GK-3988)

(PB-194016; TR-6) Avail: NTIS CSCL 08C

The structure of turbulent shear flows above propagating waves was investigated in a wind and wave facility at the University of Florida. The existence of the wave-induced perturbations and their importance in transferring momentum to waves is a central question in this study. The mean velocity profiles were measured by a pitot-static probe and a pressure transducer. The turbulent air velocities were measured in the horizontal and vertical directions by using a two channel hot-film anemometer. Power-spectrum analyses of the turbulence measurements were conducted with the use of an analog power spectrum analyzer with special low-frequency and narrow-band pass capabilities. In addition, the turbulence measurements above mechanical waves were phase averaged with respect to the frequency of the mechanical wave by analog means in which the wave was used as a trigger. Author (USGRDR)

N71-14730# Sperry Rand Research Center, Sudbury, Mass.

DEVELOPMENT OF MARK 1 RADIOMETRIC THERMASONDE AND SIMULATION AND EXPERIMENTAL STUDIES FOR PASSIVELY PROBING TEMPERATURE STRUCTURE WITHIN THE FIRST MILE OF THE ATMOSPHERE Final Report, 1 Apr. 1969 - 21 Sep. 1969

W. D. Mount, A. C. Anway, C. V. Wick, C. M. Maloy, and R. Wilt 1969 115 p refs

(Contract PH-22-68-22)

(PB-192333; SRRC-CR-70-6) Avail: NTIS CSCL 04A

Specifications for development of the Mark 1 radiometric Thermasonde (TM) are listed and performance characteristics are described. The paper, 'Use of Millimeter Wave Radiometry to Remotely Measure Atmospheric Stability,' presented at the Symposium on Advances in Instrumentation for Air Pollution Control, which describes work accomplished under this contract is appended. Simulated and experimental radiometric results are discussed for climatological and equipment effects in the observing of lapse, ground-based, and elevated inversions. A nonlinear nomogram was developed to correct for radiometric smoothing of intensity and height of ground-based inversions. Different observing modes and signal processing techniques assist in the interpretation of radiometric soundings for use in detecting elevated inversions. Author (USGRDR)

N71-14748 Georgia Univ., Athens.

SLOPE FAILURE FORMS: THEIR IDENTIFICATION CHARACTERISTICS, AND DISTRIBUTION AS DEPICTED BY SELECTED REMOTE SENSOR RETURNS

Donald Hudson Poole (Ph.D. Thesis) 1969 203 p

Avail: Univ. Microfilm: HC $9.25/Microfilm $3.00 Order No. 70-1189

The forms of slope failure include erosional forms of sheet wash, rill wash, and gullying which result from sheet or channelized

overland flow; and mass wastage forms of creep flow, slide, and fall which result from gravitational movement. Results of the study indicate that the mapping of slope failure forms can be achieved relatively easily and rapidly providing suitable aerial photographs are available. This is especially true if the interpreter has criteria in mind which can be applied in recognizing and identifying slope failure forms. Small scale photography most suitable for general slope failure studies should be at a scale of 1/20,000 to insure recognition and positive identification of erosional and mass wastage forms. Large scale photography at a scale of 1/10,000, or larger, would be appropriate and conducive to microstudies of slope failure phenomena. Either Ektachrome or Ektachrome infrared imagery would produce good results provided the photography was of high quality. Dissert. Abstr.

N71-14747 New Hampshire Univ., Durham.
INVESTIGATION OF AURORAL PHENOMENA BY SOUNDING ROCKET
Wentworth Edwards Potter (Ph.D. Thesis) 1969 222 p
Avail: Univ. Microfilms: HC $10.15/Microfilm $3.00 Order No. 70-4590

The results from five rocket flights are presented. The rockets were launched during a variety of auroral and magnetic conditions although they had similar trajectories. Magnetic disturbances measured during the flights indicated the existence of electrojet currents near 100 km flowing parallel to the visible auroral arcs. The presence of field aligned currents was indicated in the results of one flight. Electric fields perpendicular to the magnetic field were measured. Fields of 25 to 70 mv/m were measured during all except one quiet time flight in which an upper limit of 20 mv/m was obtained for the electric field. The fields pointed southward and were consistent with a westward flowing Hall current. Charged particle flux measurements showed particle precipitation existed during periods of visible auroral activity. A correlation between an increase in luminosity and an increase in flux was noticed. Particle precipitation was also indicated on ground based riometers. Dissert. Abstr.

N71-14756# Allied Research Associates, Inc., Concord.
THE USE OF ENVIRONMENTAL SATELLITE DATA FOR MAPPING ANNUAL SNOW-EXTENT DECREASE IN THE WESTERN UNITED STATES Final Report
James C. Barnes and Clinton J. Bowley Jun. 1970 111 p refs
(Contract ESSA-E252-69(N))
(PB-194004; ARA-8G72-F) Avail: NTIS CSCL 08L

Techniques to map areal snow extent from environmental satellite photography are tested in three regions of the western United States during the 1967 and 1969 snowmelt seasons. The three regions, each with characteristically different terrain, forest cover, and snowfall climatologies, are: (1) the southern Sierra Nevada in California, (2) the Upper Columbia Basin in Idaho and Montana, and (3) the Salt River Project Area in Arizona. The principal data sample is AVCS photography from the ESSA satellites; in addition, IDCS photography and daytime HRIR data from the Nimbus 3 satellite are also examined. Snow-extent measurements from aerial surveys are used as ground-truth data. The results indicate that of the three regions tested satellite imagery provides the most reliable measurements of snow extent in the southern Sierras. In the Kings River Basin, the satellite snow-line elevation is within 500 feet of the aerial-survey snow-line elevation, with the satellite value being higher in 10 of 11 cases analyzed. Author (USGRDR)

N71-14758# Hawaii Inst. of Geophysics, Honolulu.
RECONNAISSANCE SAND INVENTORY, OFF LEEWARD OAHU
J. F. Campbell, W. T. Coulbourn, R. Moberly, Jr., and B. R. Rosendahl Jun. 1970 50 p
(Grant NSF GH-28)
(PB-193992; HIG-70-16; SEAGRANT-70-2) Avail: NTIS CSCL 08J

The southern and western coasts of Oahu have been surveyed for shallow-water sand bodies, using a seismic reflection technique. Sand bodies discovered and mapped in water depths of between 60 and 300 feet contain about 370 million cubic yards of sand. Samples from a few locations were of fine-grained calcareous sand that was similar to, but finer than, most Hawaiian beach sands. The reconnaissance survey points to several localities where detailed sampling and mapping are warranted. Author (USGRDR)

N71-14759*# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
ON THE CONSTRUCTION AND USE OF THE PENN STATE Mk 1 IONOSPHERIC MODEL
J. S. Nisbet 1 May 1970 104 p refs
(Grant NGL-39-009-003)
(NASA-CR-115894; SR-355) Avail: NTIS CSCL 04A

The parameters controlling the development of a simple model of the E and F regions of the ionosphere are discussed. Uses of such models in scientific investigations and engineering applications are given. A computer model is described which will provide estimates of the electron and ion densities in middle latitudes as a function of latitudem longitude, altitude, season, time, and solar activity. Statistical parameters for mid latitude blanketing sporadic E are presented. The restrictions on the model and the availability of data on suitable boundary conditions are discussed. Author

N71-14770*# Massachusetts Inst. of Tech., Cambridge. Measurement Systems Lab.
REPRESENTATION OF THE EARTH'S GRAVITATIONAL POTENTIAL
John P. Vinti [1970] 28 p refs
(Grant NGR-22-009-311)
(NASA-CR-115893; RE-71) Avail: NTIS CSCL 08N

The earth's gravitational potential V, outside a sphere bounding the earth, by means of its difference, delta V, from the author's spheroidal potential is presented. The difference, delta V, is in turn represented as arising from a surface density, sigma, on the sphere bounding the earth. Because of the slow decrease with order n of the normalized coefficients in the spherical harmonic expansion of V, the density anomalies from which the higher coefficients arise must occur in regions close to the earth's surface. The surface density, sigma, is thus an idealization of the product of the density anomaly, delta rho; and the crustal thickness b. Values of sigma are computed from potential coefficients obtained from two sources. The two sources give qualitative agreement for the values of sigma and for its contour map. The numerical values obtained for sigma are compatible with the idea that the responsible density anomalies are reasonably small, i.e., less than 0.05 grams per cubic centimeter, and occur in the crust alone. Author

N71-14783# Teledyne Isotopes, Palo Alto, Calif.
USE OF ARn/Ra RATIOS TO DETERMINE AIR/SEA GAS EXCHANGE AND VERTICAL MIXING IN THE OCEAN Final Technical Report
David R. Schink, Joel J. Sigalove, Robert L. Charnell, and Norman L. Guinasso, Jr. 6 Feb. 1970 50 p refs
(Contract N00014-69-C-0254)
(AD-713129; PALTR-223) Avail: NTIS CSCL 8/3

A program to measure Rn(222)/Ra(226) ratios in the ocean surface layer as part of the BOMEX experiment has demonstrated that blanks are acceptably low--but significant; that radon collection is essentially complete; and that the gas can be transferred and counted at sea. Nine radon blanks and ten radon samples were run. One profile of radon ratios gave results much as expected. The

results are consistent with a boundary film thickness of 10-15 microns. Below the uppermost water layer the vertical eddy diffusivity is approximately 5 sq cm/sec. Absolute values of radon concentration were lower than previously observed. The differences may be due to our larger sample volumes with correspondingly less contamination effect and better blank control. Using air-sampler equipment furnished by Battelle, five air samples were analyzed for radon daughter products. Marine air in this region has 6 dpm/cu m, much less randon than average continental air, but slightly more than expected in the average marine environment. Author (TAB)

N71-14784# Litton Systems, Inc., Minneapolis, Minn. Applied Science Div.
UPPER AIR SAMPLING AND MONITORING PROGRAM Final Comprehensive Report, Apr. 1966 - Jun. 1968
R. D. Conlon Jul. 1970 90 p refs
(Contract AT(11-1)-401)
(COO-401-162; TR-3430) Avail: NTIS

The acquiring of useful data on radioactive debris at high altitudes required the development of balloon-borne particulate sampling systems and of highly sensitive instrumentation for controlling, monitoring, and recording sampling systems performance. The progr · followed in developing these devices is summarized starting with the first low altitude sampler and finally resulting in third generation sampling devices and sampler performance monitors for operation to altitudes of 140,000 ft. The equipment used in the field today includes the direct flow sampler, the 1000-cfm air ejector sampler, the HV-3000 sampler, the models PR-2 and PR-3 flowmeter, the B-58 densitometer altimeter, and a solid-state, 40-megacycle data transmission system. NSA

N71-14791*# Raytheon Co., Sudbury, Mass. Wayland Labs.
SPACE GEODESY ALTIMETRY VERIFICATION EXPERIMENT DESIGN STUDY (VEDS) Final Report
Ephraim Weiss and L. F. Coppenrath, ed. Apr. 1970 436 p refs
(Contract NASw-1920)
(NASA-CR-115897; SR70-4108) Avail: NTIS CSCL 08E

A study was conducted for NASA OSSA & NASA Wallops Station to design an experiment to verify the performance of a 5-meter spaceborne altimeter operating over the sea surface in 1972 and to derive data to aid in the design of higher performance altimeters. Four methods of verification are presented and analyzed, indicating that precision can currently be verified to within 3 meters, and with appropriate modifications, accuracy can be verified to 5 meters. Error studies identify current limitatons on verification. Design data requirements and altimeter implications are identified for echo waveform, backscatter coefficient, and correlation time. Author

N71-14796 New Mexico State Univ., University Park.
VELOCITY AND STRESS DISTRIBUTIONS IN THE EARTH'S MANTLE DUE TO SECULAR VARIATION OF THE GEOMAGNETIC FIELD
Michel Charles (Ph.D. Thesis) 1969 86 p
Avail: Univ. Microfilms: HC $4.60/Microfilm $3.00 Order No. 69-16246

The Dynamo theory and the secular variations of internal origin of the earth's magnetic field are used to determine the motions of the fluid in the earth's core. It is assumed that stresses are created by these motions at the inner part of the earth's mantle. The propagation of these stresses to the earth's surface is determined by the solution of the Navier-Stokes Equations, the mantle being taken as a highly viscous fluid. An expression for the displacement velocity and the stresses near the earth's surface is obtained, which gives results in good agreement with the known magnitudes and direction of the continental drift and the location of the major seismic shocks. Thus, these two phenomena seem to be closely related to the geomagnetic field and its variations. Dissert. Abstr.

N71-14797 Case Western Reserve Univ., Cleveland, Ohio.
THOMSON SCATTER STUDY OF IONOSPHERIC SCINTILLATIONS
Thomas Frederic Trost (Ph.D. Thesis) 1969 109 p
Avail: Univ. Microfilms HC $5.40/Microfilm $3.00 Order No. 70-4993

Measurements of electron density fluctuations in the ionosphere were made while observing ionospheric scintillations of cosmic radio sources at 40 MHz. Electron densities were measured by 430 MHz Thomson scatter radar along the line of sight to the radio source from the E region up to 600 km. Irregularities in electron density as large as 10% were found in layers less than 10 km thick in the F region. Often the irregularities appeared as nearly sinusoidal variations on the electron density. It was assumed that one could identify the layer that produced the observed scintillations because it would have fluctuations with the same period (approximately 2 min.) as found in the scintillation data. In four experiments layers between 270 km and 330 km could thus be identified as the likely cause of the scintillations. Fluctuations in electron density on the order of 4-8 min. which extended over the entire observable range in the F region were also observed. Dissert. Abstr.

N71-14800# Sandia Corp., Albuquerque, N.Mex. Safety Engineering Div.
STATISTICAL AND OTHER INFORMATION CONCERNING THE ELECTRICAL POTENTIAL GRADIENT
E. F. Armbrust Jul. 1970 30 p refs Sponsored by AEC
(SC-RR-70-411-A) Avail: NTIS

A brief resume of the atmospheric electrical potential near the earth's surface is presented along with information on the dangers of high potential gradients, especially when explosives are being handled. Information on the local environment and the adaptation of a radioactive probe for measuring grandients is also given. Included is an analysis of the potential gradient measurements taken over a period of 1 year within Sandia Laboratories work areas. Author (NSA)

N71-14803*# Oregon Univ., Eugene. Dept. of Geology.
PLAGIOCLASE THERMOMETRY OF IGNEOUS ROCKS Final Report
D. F. Weill [1970] 2 p
(Grant NGR-38-003-009)
(NASA-Cr-115896) Avail: NTIS CSCL 08G

Research conducted during the investigation of plagioclase thermometry of igneous rocks has made it possible to treat quantitatively two of the important properties of silicate melts, density and plagioclase crystallization. These properties have been systematically investigated with respect to their dependence on composition and temperature, and the resulting models are valid for a wide range of geologic situations. A.L.

N71-14804*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
ON EXPLANINING THE F-REGION SEASONAL ANOMALY IN TERMS OF COMPOSITION CHANGES IN THE LOWER ATMOSPHERE
S. Chandra and P. Stubbe (Max-Planck-Institut fur Aeronomie) Dec. 1970 9 p refs Submitted for publication
(NASA-TM-X-65410; X-621-70-459) Avail: NTIS CSCL 04A

Any change in the relative concentrations of O and N2 in the lower atmosphere generates a complex chain of events which not only affects the ionospheric parameters, but the atmospheric parameters as well. The effects of this change on the seasonal behavior of the neutral atmosphere are discussed. A.L.

N71-14808# Physical Research Lab., Ahmedabad (India).
INTERNATIONAL SYMPOSIUM ON EQUATORIAL

AERONOMY (3RD)
Kalpathi R. Ramanathan and Pisharoth R. Pisharoty 14 May 1970 18 p refs Symp. held at Ahmedabad, India, 3-10 Feb. 1969
(Contract EOOAR-0057-69)
(AD-713199; ISEA/73; AFCRL-70-0530) Avail: NTIS CSCL 4/1

The report is of a Symposium on Equatorial Aeronomy held at Ahmedabad, India, February 3-10, 1969. The subjects covered included the constitution, morphology and behaviour of the upper atmosphere over the equatorial belt, with particular reference to the region between altitudes of 50 and 1000 km. The electrical properties, chemical and photo-chemical processes, optical emissions and their relation to solar and other extra-terrestrial phenomena were included. Extended abstracts, together with diagrams of the new work presented at the meeting have been published as Proceedings of the Symposium in 2 volumes. Author (TAB)

N71-14814# Ionosphären-Institut Breisach (West Germany).
IONOSPHERE DATA, VERTICAL-ECHO-SOUNDING: FREIBURG, URSI-CODE 131, OCTOBER 1970 [IONOSPHAEREN-DATEN, VERTIKAL-ECHO-LOTUNG: FREIBURG, URSI-CODE 131, OKTOBER 1970]
Oct. 1970 44 p In ENGLISH and GERMAN
(Rept-292-F) Avail: NTIS

Daily summaries are presented for vertical echo sounding of the upper atmosphere over Freiburg, Germany during October, 1970. The data include charts of median values for the E and F regions. Author

N71-14816 Iowa Univ., Iowa City.
ON THE DEPOSITION OF MAGNETOSPHERIC ELECTRONS INTO THE EARTH'S UPPER ATMOSPHERE
John Delano Craven (Ph.D. Thesis) 1969 250 p
Avail: Univ. Microfilms: HC $11.25/Microfilm: $3.25 Order No. 70-4343

Observations of the energy fluxes > 5 keV electrons over the northern auroral regions at 530 to 2500 km altitude were obtained from February, 1965 through July, 1966, during a period of minimum solar activity, by means of the nearly polar orbiting satellite Injun 4. Quantitative comparisons of the percentages of occurrence of the fluxes > 40 keV electrons precipitating into the earth's upper atmosphere, with corresponding percentages of occurrence for the absorption of cosmic radio noise at ionospheric altitudes below the precipitating > 40 keV electrons, at auroral latitudes, show that they generally agree to within a factor of 2. The results of the first detailed survey of the percentages of occurrence of the energy fluxes of > 5 keV electrons at nearly all local times and at latitudes greater than 45 deg are graphically displayed for various energy flux thresholds. Dissert. Abstr.

N71-14822# Pisa Univ. (Italy). Ist. di Geodesia e Topografia.
REDUCTIONS FOR CORRECTING GRAVITY MEASUREMENTS WHEN THE TERRAIN IN THE IMMEDIATE VICINITY OF THE STATION CAN BE SCHEMATIZED WITH THAT OF A PLANE OF KNOWN SLOPE [RIDUZIONE DE APPORTARE ALLE MISURE DI GRAVITA QUANDO L'ANDAMENTO DEL TERRENO NELLE IMMEDIATE VICINANZE DELLA STAZIONE PUO ESSERE SCHEMATIZZATO CON QUELLO DI UN PIANO DI NOTA PENDENZA]
Silvio Ballarin Jun. 1968 6 p In ITALIAN *Its* Ser. 25, No. 1237
(Publ-63) Avail: NTIS

The use of topographic reductions in measuring gravity for the area in the immediate vicinity of the station, in which the terrain is compared schematically with a plane of known slope is evaluated. The numerical values of the expressions for these limited reductions, which concern the Hayford subdivisions, are tabulated. Transl. by F.O.S.

N71-14826 California Inst. of Tech., Pasadena.
THE PHOTODISSOCIATON OF WATER VAPOR, EVOLUTION OF OXYGEN AND ESCAPE OF HYDROGEN IN THE EARTH'S ATMOSPHERE
Robert Terry Brinkman (Ph.D. Thesis) 1969 162 p
Avail: Univ. Microfilms: HC $7.60/Microfilm $3.00 Order No. 70-555

A theoretical analysis of the origin and evolution of earth atmosphere is presented. In order to correct the errors contained in previous studies, accurate angular and velocity dependencies have been calculated for the cross-section for the elastic scattering of an H or He atom by an O atom and particles missing from the real atmosphere by virtue of the escape process have been considered. It is concluded that no firm picture can be sketched of the condition of the earth's early atmosphere from these considerations. Dissert. Abstr.

N71-14827# Communications Research Centre, Ottawa (Ontario). Dept. of Communications
A SURVEY OF SEA-ICE-THICKNESS MEASURING TECHNIQUES
A. W. Adey Dec. 1970 28 p refs
(CRC-1214) Avail: NTIS

The approaches that have been made to the problem of measuring sea-ice thickness by indirect means, the most serious difficulties involved in making such measurements, and the major capabilities and limitations of the several techniques are discussed. It is concluded from this review that there has not been proven, so far, a technique that can provide quantitative sea-ice-thickness data for survey purposes. Four techniques that are currently being seriously considered as offering potential for development as Remote-sensing devices to provide quantitative sea-ice-thickness data based on sensing to depth in the ice are (1) the multi-frequency microwave (UHF) radiometer, (2) the elastic-wave, or seismic-acoustic devices, (3) the dynamic penetrometer, and (4) the devices based on radio-propagation effects and operating in the frequency range from VLF to low MHz. Author

N71-14828# Environmental Research Corp., Alexandria, Va.
MODELS FOR GENERATING SYNTHETIC SEISMOGRAMS
Robert D. Lynch, John R. Murphy, Walter W. Hays, and Spencer L. Williams Aug. 1970 75 p refs
(Contract AT(29-2)-1163)
(NVO-1163-217) Avail: NTIS

Two models for the generation of synthetic seismograms are described. The first model derives a seismogram by applying a time-varying filter to a white noise source. The second model uses an observed seismogram as input to an analog filter realization of a deterministic model of the seismic source function for underground nuclear detonations. The seismograms generated by these models are compared with actual measured seismograms and the agreement between the two is shown to be quite satisfactory. The results of ths study, although preliminary, represent a technique having great utility in predictive studies related both to underground nuclear testing program and to the field of earthquake engineering. Recommendations for extending the results of this study are given in the context of developing the capability to predict accurately the time history expected at a given site from either an underground nuclear explosion or an earthquake. Author (NSA)

N71-14839*# Translation Consultants, Ltd., Arlington, Va.
PHYSICAL PROPERTIES OF SOME ROCKS OF INDIA AND CEYLON AND THEIR ABSOLUTE AGE [O FIZICHESKIKH SVOYSTVAKH NEKOTORYKH GORNYKH POROD INDII I TSEYLONA I IKH ABSOLYUTNOM VOZRASTE]
G. D. Afanasyev et al Washington NASA Jan. 1970 36 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Geol. (USSR), no. 3, 1964 p 22-42
(Contract NASw-2038)

(NASA-TT-F-13416) Avail: NTIS CSCL 08G

Investigation of samples taken from the surface and investigated at emospheric pressure indicate a great variety of physical properties in rocks of this geological region. Tables of the physical properties are presented along with discussions on the significance of these data. Author

N71-14840# Auroral Observatory, Tromso (Norway).
A RESONANT SPECTRA AND TEMPERATURE MEASUREMENT OF THE THERMOSPHERE. PART 2: DEDUCED TEMPERATURE PROFILES AT A HIGH LATITUDE Final Scientific Report, 1 Feb. 1968 – 31 Mar. 1970
Ove E. Harang 30 Apr. 1970 28 p refs
(Contract AF61(052)-906)
(AD-713676; AFCRL-70-0442; FSR-2) Avail: NTIS CSCL 4/1

In January and August 1968 a series of rocket release experiments for upper atmosphere structure were performed. These experiments involve density profile and wind profile measurements and also measurements of atomic oxygen, both the neutral density profile and the emission profile of the oxygen line OI(5577). The experiments consisted of chemical releases of nitrogen oxide (NO) and Trimethyl Aluminum (TMA). The TMA release during twilight gave spectra of the A squared sigma minus X squared sigma transition of molecular A10. These spectra were taken from different altitudes and when analyzed, gave temperature profile of the thermosphere. Measured temperature profiles from these experiments were compared with the COSPAR International Reference Atmosphere of 1965 (CIRA 1965) and also compared with the US Standard Atmosphere Supplement of 1966. Author (TAB)

N74-14844# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Geophysical Branch.
MAGNETIC SURVEY OF THE SAVAGE RIVER AND LONG PLAINS IRON DEPOSITS, NORTHWEST TASMANIA
E. N. Eadie 1970 89 p refs
(Bull-120) Avail: NTIS

Described are magnetic surveys of the Savage River and Long Plains iron deposits in northwest Tasmania. The results of the surveys are shown as vertical magnetic field contours. Included is a discussion of the theoretical magnetic anomaly due to an infinitely long dipping vein of infinite depth extent, and an interpretation for the magnetic anomalies observed on a selection of traverses. The drilling completed at Savage River and Long Plains as of May 1964 is summarized and compared with magnetic profiles. Recommendations for additional drillings are made, particularly in areas where drilling has not been done. Author

N71-14845*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
A CATALOG OF ATMOSPHERIC DENSITIES FROM THE DRAG ON FIVE ARTIFICIAL SATELLITES
Luigi G. Jacchia and Jack W. Slowey 16 Oct. 1970 125 p refs
(Grant NGR-09-015-002)
(NASA-CR-115898; SAO-Special-Rept-326; SAO-009-09) Avail: NTIS CSCL 04A

Densities derived from atmospheric drag are presented for five artificial satellites with perigee heights between 250 and 560 km. The data from each of four of these satellites cover an interval of 1300 days. The data extend and supplement those published in 1965. Author

N71-14846# Washington State Dept. of Natural Resources, Olympia.
EARTH RESOURCES OBSERVATION SATELLITE IMAGE UTILITY AT STATE LEVEL Final Report
David W. Jamison Apr. 1970 158 p refs
(Contract DI-14-08-0001-G-21)
(PB-193859; USGS-DO-70-003) Avail: NTIS CSCL 08B

The utility of the proposed EROS program as an information source for operational state agencies and academic institutions has been explored within the State of Washington. Personnel from natural resources and land use oriented state agencies participated. Research personnel from the University of Washington and Washington State University carried out studies of the imagery. High altitude, small scale photographs, both singly and in mosaic form, were used to simulate ERTS imagery. Participants were asked to relate their data needs to the proposed ERTS imagery and the timeliness of satellite surveillance. Resulting evaluation lead to the following conclusions: significant data use of ERTS imagery can occur at the state level; potential user knowledge of the availability of aerial photography and how to use it is poor; ERTS imagery simulation process used in this study was poor; and satellite relay ground sensor data would be of significance to many users. Author (USGRDR)

N71-14847# Battelle Memorial Inst., Columbus, Ohio.
DARIEN PHYTOSOCIOLOGICAL DICTIONARY. BIOENVIRONMENTAL AND RADIOLOGICAL-SAFETY FEASIBILITY STUDIES, ATLANTIC-PACIFIC INTEROCEANIC CANAL
James A. Duke and Duncan M. Porter (Missouri Botan. Garden) 1 Jun. 1970 70 p refs
(Contract AT(26-1)-171)
(BMI-171-37) Avail: NTIS

Vegetation types found along the proposed canal routes in Panama are listed and described and pertinent observations on Panama vegetation types are included. Tables are presented to show relationships between the forest types of Darien, key to Darien forest types, zonal vegetation types along potential canal routes, and attributes of some Darien localities. An appendix is included in which approximately 1200 species of seed plants are listed taxonomically and classified according to forest type. NSA

N71-14848# Stanford Univ., Calif. Dept. of Civil Engineering.
SUMMAC: A NUMERICAL MODEL FOR WATER WAVES
Robert K.-C. Chan and Robert L. Street Aug. 1970 172 p refs
(Contract Nonr-225(71), Grant NSF GK-2506)
(AD-713444; TR-135) Avail: NTIS CSCL 8/3

The work focuses on the numerical studies of large water waves with particular application to storm-generated waves and tsunamis. The specific objective is the exact simulation on a digital computer of nonlinear waves in the shallow water zones. The study is based on the simulation technique called SUMMAC (the Stanford-University-Modified-Marker-And-Cell Method). The flow field is represented by a rectangular mesh of cells and a line of hypothetical particles which defines the free surface. Finite-difference Navier-Stokes equations are used as the governing equations of the velocity fields while the pressure field is obtained by solving a finite-difference Poissons equation. The currently implemented SUMMAC is limited to waves that are non-breaking and non-turbulent. Author (TAB)

N71-14849# Coast and Geodetic Survey, Washington, D.C.
SEISMIC DATA FROM RULISON
Jul. 1970 178 p refs Sponsored by Arms Control and Disarmament Agency
(ACDA/ST/RA-62) Avail: Issuing Activity

The underground nculear explosion, Rulison, was detonated on 10 September 1969 near Rifle, Colorado, primarily for the purpose of investigating the use of such explosions to stimulate natural gas production, and also for international exchange of seismic data. A resume of data and representative seismic signals from Rulison are presented. Data were acquired from 189 seismic stations and arrays located in 17 countries. Teleseismic data

from Rulison indicated an average body wave magnitude of 4.9. Teleseismic surface waves with periods primarily in the 10 to 12 seco range indicated an associated surface wave mangitude of 4.5. The amplitudes of principal phases indicate more efficient wave propagation in eastern than in western North America. Author

N71-14860# Research Inst. of National Defence, Stockholm (Sweden).
WORKING PAPER DESCRIBING THE HAGFORS SEISMOLOGICAL OBSERVATORY IN SWEDEN
14 Aug. 1969 6 p Reprinted *Its* Reprint No. 1969170:6
(FOA-4-B-4032-20; ENDC/257) Avail: NTIS

Details are given of the instrumentation, data outputs and analysis, monitoring and control, and calibration. The tripartite seismological array station was established for research and a better understanding of the control problems connected with a treaty banning undergound nuclear weapons tests. N.E.N.

N71-14861# Bureau of Meteorology, Melbourne (Australia).
MONTHLY CLIMATE DATA, SURFACE, AUSTRALIA, JULY 1970
Jul. 1970 69 p refs
Avail: NTIS

Climatological statistics most likely to meet the need of commerce, education, primary and secondary industry, research and other fields are tabulated. The mean monthly data include pressure, cloud, temperature, sunshine, rain, evaporation, and wind measurements for each district. Author

N71-14862# Ionospharen-Institut Breisach (West Germany).
IONOSPHERE DATA, VERTICAL-ECHO-SOUNDING: FREIBURG, URSI-CODE 131, SEPTEMBER 1970 [IONOSPHAEREN-DATEN, VERTIKAL-ECHO-LOTUNG: FREIBURG, URSI-CODE 131, SEPTEMBER 1970]
Sep. 1970 44 p In ENGLISH and GERMAN
(Rept-291-F) Avail: NTIS

Daily summaries are presented for vertical echo sounding of the upper atmosphere over Freiburg, Germany, during September 1970. The data include charts of median values for the E and F regions, MUF(3000)F2, M(3000)F2, h'F2, hpF2, foF1, MUF(3000)F1, M(3000)F1, h'F, foE, foE2, h'E, foEs, FbEs, H'Es, Type Es, foT, and fmin. Author

N71-14865# Texas Univ., Austin. Antennas and Propagation Div.
NEW MEASUREMENTS OF LOW ALTITUDE REGIONS OF DISTRIBUTED INDEX OF REFRACTION BY RADAR, INSTRUMENTED AIRCRAFT AND PIBALS
Alfred H. La Grone and Andrew P. Deam 16 Apr. 1970 15 p refs
(Grant NSF GA-11462)
(PB-192345; P-44) Avail: NTIS CSCL 04A

Simultaneous observations of visually clear air at elevations up to 6 km have been made with a vertically looking S-band radar and an instrumented airplane. Regions of disturbed index refraction were detected by the radar and verified by the airborne refractometers. Physical turbulence experienced by the airplane pilot and measured by an accelerometer was observed. The physical turbulence was frequently found to be in the vicinity of the region of disturbed index of refraction, but not always. Turbulent layers were reported by the aircraft that were not detected by either the radar or the refractometers. Regions of greatest wind shear were found to be physically turbulent. Author (USGRDR)

N71-14866# Oslo Univ. (Norway). Inst. of Geophysics.
A MERIDIONAL MODEL OF THE OXYGEN-HYDROGEN ATMOSPHERE
Eigil Hesstvedt Aug. 1970 30 p refs
(Contract DAJA37-69-C-0011)
(AD-713621; ARDG(E)-E-1282) Avail: NTIS CSCL 4/1

A meridional model of the oxygen-hydrogen atmosphere between 65 km and 105 km is presented. Vertical transport, by eddies and by mean motion, is considered, while horizontal transport is disregarded. Sources and sinks of heat are computed. It is concluded that the horizontal variations in the chemical composition are relatively small. The chemical composition of the upper mesosphere and lower thermosphere is therefore believed to be largely determined by photochemistry and vertical transport. Author (TAB)

N71-14867# Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
A PROCEDURE FOR COMPUTING AND DISPLAYING TIME VARYING POWER SPECTRA ILLUSTRATED BY APPLICATION TO A GEOPHYSICAL PROCESS
Donald G. Wilson Aug. 1970 46 p refs
(Contract N00014-67-A-0163-0006)
(AD-713190; TR-67; Ref-70-7) Avail: NTIS CSCL 8/3

Computing time dependent power spectra is an important method for studying nonstationarities in signals. An efficient procedure for computing such spectra and displaying them immediately is requisite for effective application. The method presented is based on a date window which moves along the signal in unit increments. The spectrum is updated for each new sample. All spectra are displayed on a computer graphic terminal and the algorithm was deliberately constructed to make computer graphic display efficient. Author (TAB)

N71-14868# Woods Hole Oceanographic Institution, Mass.
CRUISE REPORT CHAIN CRUISE 98
Gordon H. Volkmann Sep. 1970 19 p
(Contract N00014-66-C-0241)
(AD-713105; WHOI-Ref-70-38) Avail: NTIS CSCL 8/3

Mooring work to be done was the recovery of Station 322, (a two-month study of the upper layer at Site D), and the remains of Station 320 which has already parted by the time of the January cruise but had been left on the bottom because of rough weather. It was planned to set five bottom moorings along 70 degrees W. in an array extending from 37 deg 30 min N. to 28 degrees N. Author (TAB)

N71-14869 College of William and Mary, Williamsburg, Va.
OPTICAL RADAR OBSERVATIONS OF THE STRATOSPHERE AND MESOSPHERE
Douglas Parker Woodman (Ph.D. Thesis) 1969 114 p
Avail: Univ. Microfilms: HC $5.60/Microfilm $3.00 Order No. 69-22082

A sensitive optical radar system is described, and measurements of the molecular and particulate content of the atmosphere made at Wallops Island, Virginia are presented. The backscattered signal from vertically directed laser pulses has been measured using both analog and digital photomultiplier current measurements. These measurements have permitted a calculation of the relative volume backscatter cross section of the atmosphere at altitudes from 10 km to 80 km. The data has been fitted to a curve based on the U. S. Standard Atmosphere Supplements, 1966, which represents the scattering from a pure molecular atmosphere. Data points which fall appreciably above the molecular scattering curve are interpreted as evidence of aerosol or particulate scattering. Dissert. Abstr.

N71-14876 Ohio State Univ., Columbus.
ESTABLISHMENT OF AN IDEAL WORLD GEODETIC SYSTEM
John Badekas (Ph.D. Thesis) 1969 178 p

Avail: Univ. Microfilms: HC $8.20/Microfilm $3.00 Order No. 69-22089

A world-wide geodetic system which will best serve the present needs of geodesy is defined by four groups of components. These are geocentric coordinates and associate variances of physical points, spherical harmonics, coefficients of the geopotential, a mean earth ellipsoid, and a group of seven transformation parameters for each datum which connects the geocentric coordinates with the geodetic coordinates of that datum. The method of determination of that system is given, based on all types of presently available geodetic observations, namely, terrestrial triangulation, astronomic observations, terrestrial gravity observations, and geometric and dynamic satellite observations. For all these observations, proper mathematical models are given. Dissert. Abstr.

N71-14877# Comisseo Nacional de Atividades Espaciais, Sao Jose Dos Campos (Brazil).

GEOGRAPHY AND URBAN STUDIES: REMOTE SENSING PROJECT, PHASE C Final Report

Aida O. Ferreira De Barros Sep. 1970 7 p

(LAFE-133) Avail: NTIS

The elements of the urban environment (geology, soils, vegetation) and of the urban structure (sociology, traffic and public safety with fire, flood, law enforcement, etc.), within global or sectorial characterizations (director plans, integrated urban-rural and geoeconomical plans) can be better interrelated by remote sensors which constitute the largest system capable of producing automatic procedures for management goals. Author

N71-14878 Meteorological Office (Gt. Brit.)

AN OBSERVATIONAL STUDY OF THE MERIDIONAL FLUX OF ENERGY AND ANGULAR MOMENTUM IN THE TROPOSPHERE AND LOWER STRATOSPHERE AT LATITUDE 30 DEG NORTH USING 1958 IGY DATA, VOLUME 15

A. E. Parker 1970 134 p refs *Its* Geophys. Mem. No. 113

(MET-O-808c) Copyright. Avail: HMSO £3 5s; BIS $8.50

During the International Geophysical Year much information was amassed about the atmosphere round the latitude circle 30 N. From this data extensive numerical calculations of the meridional flow, relative angular momentum and energy flux were made. March, June, September and December 1958 were chosen as being the most representative months. Most of the calculations were in broad agreement with previous findings although there are still uncertainties concerning the energy transports. The findings do, however, show the importance of the Hadley cell in transporting energy northwards. Author

N71-14879# Utah State Univ., Logan. Center for Water Resources Research.

SPECTRAL INFRA-RED REFLECTION MEASUREMENTS FROM NATURAL AND TREATED ASPEN FORESTS Progress Report

Frank W. Haws, Ralph Briscoe, and Allan Steed Dec. 1969 20 p refs Sponsored by Dept. of Interior

(PB-192209; W70-07332; CWRR-14-4) Avail: NTIS CSCL 02F

Spectral reflectance measurements were made during the summers of 1967 and 1968 on a natural stand of aspen in Utah, part of which was treated with foliar chemicals. The reflectance from the vegetation due to various environmental changes was highly wavelength dependent. The laboratory measurements showed a definite decrease in infrared reflectance as the soil moisture was depleted. The field measurements in the natural watershed showed a similar reduction in infrared reflectance after a considerable number of days without precipitation. USGRDR

N71-14880# Lund Observatory (Sweden).

INTERPRETATION OF MAGNETOGRAPH RESULTS

Jan Olof Stenflo Sep. 1970 51 p refs Presented at IAU Symp. No. 43, Paris

(Rept-2) Avail: NTIS

The most important method to determine solar magnetic fields is to observe the Zeeman effect in the solar atmosphere. The polarization in magnetic-sensitive spectral lines can be analyzed and from the relative intensities and displacements of the differently polarized line components the magnetic field at the level in the solar atmosphere, where the spectral line is formed, can be found. Author

N71-14900# Stanford Research Inst., Menlo Park, Calif.

LIDAR OBSERVATIONS OF THE LOWER TROPOSPHERE DURING BOMEX

Warren B. Johnson and Edward E. Uthe Dec. 1969 49 p refs

(Contract AT(04-3)-115)

(TID-25532) Avail: NTIS

A lidar (laser radar) was flown on a U.S. Air Force WC-130B aircraft over the BOMEX area during the third experimental period (20 June to 3 July 1969). The instrument used a neodymium laser (1.06 micron wavelength) and had a firing rate of approximately one pulse per 3.5 seconds. A total of 5192 lidar signatures were collected during the eight flight missions. Most of the observations were obtained over the eastern portion of the BOMEX area at an altitude of 10,000 ft and an aircraft speed of 100 meters per sec, with a lidar pointing angle of 60 deg below the horizon. The data are of sufficient spatial extent to allow presentation in terms of vertical cross sections of optical density. A computer technique is described that adjusts and corrects the data for the range effect, instrumentation nonlinearities, and pulse-to-pulse variations in transmitted energy, and then objectively performs a contour analysis of the resulting data matrix. A number of vertical cross sections obtained in this way, and the associated average vertical profiles are presented. Author

N71-14901# Bureau of Mines, Salt Lake City, Utah. Metallurgy Research Center.

PROCESSING MANGANIFEROUS SEA NODULES

P. T. Brooks and D. A. Martin Jan. 1971 22 p refs

(BM-RI-7473) Avail: Issuing Activity

Mineral nodules from the ocean floor represent a vast potential source of manganese, nickel, cobalt, and copper. Process development studies to devise methods for recovering these metals were conducted using two types of nodules: (1) relatively low-grade calcareous nodules from the Atlantic Ocean, and (2) higher grade siliceous nodules from the Pacific Ocean. Ammoniacal carbonate leaching of reduced nodules appeared to have the best potential for processing the calcareous nodules, but the method proved to be impractical for recovering manganese. Extraction of 90 percent or better of the nickel, cobalt, and copper showed the technique to be attractive for recovery of these metals. The siliceous nodules appeared amendable to a process that starts with either a sulfur dioxide leach or a sulfation roast followed by a water leach to dissolve the soluble sulfates. Author

N71-14910# La Plata Univ. (Argentina). Asociation Argentina de Ciencias Aeroespaciales.

FIRST SYMPOSIUM ON THE APPLICATION OF REMOTE SENSORS TO DETERMINING, CONSERVING AND UNDERSTANDING OF NATURAL RESOURCES [PRIMERIO SIMPOSIO SOBRE: APLICACION DE SENSORES REMOTOS PARA DETERMINACION, CONSERVACION Y DESARROLLO DE RECURSOS NATURALES]

[1969] 125 p refs Conf. held at La Plata, 13-15 Oct. 1969 In SPANISH

Avail: NTIS

The objectives of the investigation of natural resources in agriculture, forestry, oceanography, hydrology, geology, geography, and cartography are listed. Multiband imaging techniques from Apollo 9 are analyzed in terms of film and filters. Particular areas of investigation for remote sensors are air pollution, ocean pollution, and weather forecasting. The types of data required for each of these areas are tabulated. Transl. by F.O.S.

N71-14935# Belgian Royal Observatory, Uccle.
ASTRO-GEO PROJECT SPITSBERGEN 1968–1970
P. Melchior, M. Bonatz (Bonn Univ.), and J. Blankenburgh (Norges Geografiske Oppmaling) 1970 15 p refs Reprinted In FRENCH; ENGLISH Summary Its Commun., Ser. B, No. 52 and /ts Ser. Geophys. No. 98
Avail: NTIS

The dynamic effects of the molten earth core on the slow movement of the earth's crust and on the tidal waves and associated astronomical nutations were studied by geodetic ground station measurements. An attempt was also made to use satellite triangulations for connecting the Spitsbergen region with European geodesy. Author

N71-14938# California Univ., San Diego. Scripps Institution of Oceanography.
NEAR-BOTTOM STUDIES OF THE EAST PACIFIC RISE CREST AND TECTONICS OF THE MOUTH OF THE GULF OF CALIFORNIA
Roger Lee Larson 1 Jul. 1970 181 p refs
(Contract N00014-69-A-0200-6002; Grant NSF GA-4581)
(AD-713165; SIO-Ref-70-22; MPL-U-47/70) Avail: NTIS CSCL 8/10

Bathymetric and magnetic measurements have been used to delineate the boundary between the North American and Pacific Plates in the vicinity of the mouth of the Gulf of California and indicate a spreading rate of 6 cm/yr. Magnetic anomalies, fracture zones and earthquake mechanisms indicate the validity of the rigid plate assumption for the interactions between the Pacific, American and Cocos plates. A survey with a near-bottom instrument over the East Pacific Rise crest shows lineated abyssal hills with no sediment cover at the rise crest itself. Magnetic field measurements made near the ocean floor show to a certain extent the history of the earths magnetic field over the last 1.2 million years and show a reversal transition time of 1000 years and intensity fluctuations with periods ranging between 18000 and 50000 years. Author (TAB)

N71-14939# Oak Ridge National Lab., Tenn.
EARTHQUAKES INDUCED BY UNDERGROUND FLUID INJECTION
W. C. McClain Oct. 1970 17 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3154) Avail: NTIS

In 1966, an unusual series of earthquakes near Denver, Colorado, were correlated with deep well waste disposal operations at the Rocky Mountain Arsenal. Since that time, additional investigations have confirmed the postulated cause-and-effect relationship and have established the mechanisms responsible. Because of this experience, various questions have been raised about the possibility of a similar occurrence related to ORNL's hydraulic fracturing waste disposal practices. The mechanisms of the Denver earthquake sequence are examined in detail and the conditions necessary for such a phenomena determined. These conditions are so stringent that only in very rare occasions are they approached in normal industrial or oil field deep well disposal operations. By applying these necessary conditions to the situation existing at the Oak Ridge site, it can be unequivocally demonstrated that hydraulic fracturing operations cannot result in earthquakes by the mechanism responsible at Denver. Author (NSA)

N71-14942# Catholic Univ., Santiago (Chile). Inst. of Astrophysics.
EARTHQUAKE PERIODS ACCORDING TO GMT [DIE PERIODE DER ERDBEBEN NACH WELTZEIT]
Francis Gun-Bayer 1970 40 p refs In GERMAN; ENGLISH summary
Avail: NTIS

Considered are daily and monthly periodicities of earthquakes and the unexplained facts of nightly maxima. It is shown that solar gravitational forces are not responsible because full Moon and new Moon periods do not affect periodicities. An attempt is made to correlate sunspot activities with geomagnetic unrest; differentiated is between the two different polarities and their reversals in the northern half and the southern half of the Sun during a 22-year solar activity cycle. Considered are also electromagnetic effects of the Moon on earthquake periodicity. Transl. by G.G.

N71-14968# Coast and Geodetic Survey, Rockville, Md.
THE SANTA ROSA, CALIFORNIA EARTHQUAKES, 1 OCTOBER 1969
Karl V. Steinbrugge, William K. Cloud, and Nina H. Scott 1970 103 p refs
Avail: SOD $2.00

The Santa Rosa earthquakes are of substantial engineering interest because of disproportionate damage to earthquake-resistive buildings and because of the concentration of dwelling damage into a relatively small area. The engineering and scientific findings as well as the recommendations developed from these earthquakes are presented. While the material is essentially directed toward the engineering aspects of the earthquakes, some seismic data are also included. D.L.G.

N71-14974# Ludwig-Maximilians-Universitat, Munich (West Germany). Meteorologisches Inst.
INVESTIGATION OF THE INFRARED EMISSION SPECTRUM OF THE ATMOSPHERE AND EARTH. ROCKET BORNE RADIOMETERS FOR MEASUREMENTS OF THE ATMOSPHERIC INFRARED RADIATION
W. Bangert, H.-J. Bolle, P. Burkert, and D. Rabus Mar. 1970 26 p refs
(Contract F61052-68-C-0026)
(AD-713219; AFCRL-70-0376; SR-1) Avail: NTIS CSCL 4/1

During the contracting period the radiometers for the 1970 Aerobee experiment have been designed and built. Two of the radiometers have been tested in a ballon flight experiment using the AFCRL Balloon Borne Solar Pointer BBSP Zoo. The electronic system for the rocket experiment has been constructed by Ball Brothers Corporation. The solar pointing control SPCS-2 for the Aerobee rocket was also ordered from Ball Brothers Corporation. A performance test for this system was performed in August 1969. A filter radiometer has been designed for measuring the OH airglow emission height profile from aboard the Aerobee rocket. Construction of a prototype instrument is still under way. Therefore only tests on various components have been carried out so far. Author (TAB)

N71-14994# Hawaii Univ., Honolulu. Radioscience Lab.
ATLAS OF TOTAL ELECTRON CONTENT PLOTS. VOLUME 5: 1 JANUARY–31 DECEMBER 1969
Paul C. Yuen and Thomas H. Roelofs [1970] 384 p refs
(Grants NSF GP-5404; NSF GA-1113; and NSF GA-17330)
Avail: Issuing Activity

This is Volume 5 of a series of volumes containing diurnal plots of total electron content versus time obtained at Hawaii by measuring the Faraday rotation of the polarization of VHF telemetry carrier transmissions from the geostationary satellites Syncom-3 and ATS-1. Volume 1 contains total electron content data for the period September 1, 1964 through December 31, 1965 as well as a brief description of the instrumentation and data reduction

method. Volumes 2, 3, and 4 contain content data for the calendar years 1966, 1967, and 1968, respectively. The diurnal plots contained in this volume have missing data. These have been caused by interruptions in satellite transmissions, breakdowns of our equipment, interference, and other factors. It should be noted that the data are plotted in Hawaiian Standard Time and that if results are needed for the local mean time at the sub-ionospheric point for either satellite-to-Hawaii path, then the proper time correction must be made. For Volumes 1, 2, 3, and 4, see N68-38518, N69-73945, N69-77463, and N70-32578, respectively. Author

N71-14995*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LABORATORY SIMULATION OF IMPACT CRATERING WITH HIGH EXPLOSIVES
Verne R. Oberbeck Dec. 1970 56 p refs
(NASA-TM-X-62010) Avail: NTIS CSCL 08M

Impact and explosion craters have been formed at the same scale in the laboratory. Impact craters were produced with cylinders of aluminum of mass 0.4350 gm that were impacted with velocity of 2.0 km/sec and kinetic energy of 8.7 × 10 to the 9th power ergs against quartz sand targets. Explosion craters were produced by detonating 0.150 gm charges of PETN high explosive yielding a chemical energy of 8.7 × 10 to the 9th power ergs at various depths beneath the target surface. Crater size and shape, ejecta plume growth and subsurface deformation have been determined. Measurements of cratering effects show that impact crater formation can be simulated by detonation of the explosive placed at a depth of burst of 6.3 mm + or − mm. Caution should be used in applying these results to estimate kinetic energy of formation of large impact craters because knowledge of projectile velocity might be needed in addition to crater size in order to estimate kinetic energy of formation of the crater using an explosion crater analog. Author

N71-15001*# Kansas Univ., Lawrence. Center for Research.
AN EVALUATION OF FINE RESOLUTION RADAR IMAGERY FOR MAKING AGRICULTURAL DETERMINATIONS
S. A. Morain and J. Coiner Houston, Tex. NASA. Manned Spacecraft Center Dec. 1970 48 p refs Reprinted
(Contract NAS9-10261 1)
(NASA-CR-115858; MSC-03708; CRES-TR-177-7) Avail: NTIS CSCL 17I

The results of two type of analyses performed on high resolution imagery are presented. The first analysis is strictly a visual interpretation of the imagery with its major objective being to explore possibilities for creating identification keys for crop types and states. The second approach focuses on extracting quantalog spot densities from X-1 resolution and investigating, through a set of categorization strategies, various ways of presenting the data. A series of scattergrams are presented representing each of the grouping strategies. The results of the two analyses, while inconclusive, are moderately encouraging and the significance of the information obtained is summarized. D.L.G.

N71-15417# Southwest Center for Advanced Studies, Dallas, Tex.
COMPOSITION OF THE EARTH'S UPPER MANTLE Final Report, 10 May 1966 – 31 Aug. 1970
J. L. Carter and D. C. Presnall 31 Aug. 1970 44 p refs
(Contract DA-31-124-ARO(D)-463)
(AD-713408; AROD-6435.3-EN) Avail: NTIS CSCL 8/7

The report presents the results of studies of the nature and composition of the earths upper mantle, using petrography, analytical, and synthetic techniques. The theoretical basis for these studies was established and subsequently high pressure liquidus studies were carried out using the system CaO-MgO-Al2O3-SiO2. This system was chosen to model a composition of the upper mantle because (1) it contains all the major minerals thought to exist in the upper mantle and about 90 percent of the composition of the mantle can be represented by this system, and (2) it contains the maximum number of components that can be handled geometrically with complete rigor and generality. Detailed accounts of the work are contained in the publications which were prepared during the course of the investigation. Author (TAB)

N71-15418# Kentucky Univ., Lexington. Coll. of Engineering.
PROCEEDINGS OF THE THIRD ANNUAL LAND SURVEYOR'S CONFERENCE
20 Jan. 1970 55 p refs Conf. held at Lexington, Ky., 19-20 Jan. 1970
(PB-191328; TR-22-70-CE-1) Avail: NTIS CSCL 08B

The proceedings of the annual Land Surveyor's conference are presented. Subjects discussed are: (1) personnel management, (2) state of the art in orthophoto surveying, (3) applications of aerial photography to property surveys in mountainous terrain, (4) land surveying monumentation, and (5) basic error analysis and survey design. Author

N71-15420 Texas Christian Univ., Fort Worth.
AN INVESTIGATION OF TRANSIENT MAGNETOSPHERIC CURRENT SHEETS AS GENERATORS OF MAGNETOHYDRODYNAMIC WAVES AND GEOMAGNETIC MICROPULSATIONS
Arthur Wallace Green, Jr. (Ph.D. Thesis) 1969 138 p
Avail: Univ. Microfilms: HC $6.60/Microfilm $3.00 Order No. 70-1989

Spectral analysis of micropulsation data indicates that on geomagnetically quiet days Pc3 and Pc4 micropulsations exhibit an occurrence maximum near local noon and a shift toward longer periods with an increase in the latitude of the observer. Similar analysis of Pi2 pulsation shows an occurrence maximum near local midnight and no latitudinal dependence of oscillation period. Observed Pc3, Pc4, and Pi2 oscillation periods are such, that for quiet geomagnetic conditions, a mid-latitude observer should note a day to night shift toward significantly longer periods. It is shown that analysis based on the transmission of white spectrum MHD waves through a layered ionosphere model does not seem to yield a period shift in the direction actually observed. A new mechanism for the generation and transmission of MHD waves which would produce Pc3, Pc4, and Pi2 micropulsations is proposed. This model explicitly considers a number of recently observed magnetospheric feature. An analysis of the model, including the spatial, spectral, and temporal characteristics of expected micropulsations is presented, and measurables such as power spectra, diurnal trends, and latitude dependence are compared with actual data. Dissert. Abstr.

N71-15439# Royal Aircraft Establishment, Farnborough (England).
HIGH ALTITUDE ATOMIC EXPLOSIONS: DISTURBANCES IN THE IONOSPHERE AND CIRCUMTERRESTRIAL SPACE [VYSOTNYE ATOMNYE VZRYVY: NARUSHENIYA V IONOSFERE I OKOLOZEMNOM PROSTRANSTVE]
Ya. L. Alpert Oct. 1970 23 p refs Transl. into ENGLISH from Priroda (Moscow), no. 8, 1962 p 3-13
(RAE-Lib-Trans-1448) Avail: NTIS

In connection with the statement of the Soviet Government on 4 June 1962 concerning the nuclear explosions carried out by the USA at high altitude over the Pacific Ocean an account is given of the disturbances caused by explosions in circumterrestrial space. Certain physical phenomena which arise as a result of an explosion in the upper layers of the atmosphere and in the circumterrestrial part of interplanetary space are considered. Author

N71-15437# Joint Publications Research Service, Washington, D.C.
GRAVIMETRIC DETERMINATIONS IN ANTARCTICA
N. P. Grushinsky 8 Jan. 1971 27 p Transl. into ENGLISH from Geofiz. Byull. (Moscow), no. 21, 1969 p 18–39
(JPRS-52123) Avail: NTIS

A catalog of gravimetric determinations obtained during nine Antarctic expeditions is presented. The catalog contains 755 points and is divided into four parts. The first three contain all the reference points established in the ports, from ships, on the continent, islands, glaciers, and on the fixed shore ice. The serial gravimetric points are indicated in the fourth part. The values for gravitational force at all points are reduced to the reference point of the Mirnyy station and are epxressed in a standarized world system. Author

N71-15438# Joint Publications Research Service, Washington, D.C.
AIRBORNE OCEAN AND SEA SURFACE TEMPERATURE MEASUREMENTS USING INFRARED RADIOMETERS
N. N. Verenchikov 22 Dec. 1970 11 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 235, 1970 p 146–154
(JPRS-52039) Avail: NTIS

The dynamic errors of infrared radiometers are investigated, assuming that a bolometer exhibiting a sufficiently high sensitivity, low inertia, and simplicity in operation is utilized as the radiation receiver. Design criteria that associate equipment parameters and statistical characteristics of the temperature field of the object are formulated. R.B.

N71-15439# New York Univ., N.Y. Geophysical Sciences Lab.
SEA SURFACE WIND STRESS: THEORETICAL CALCULATIONS COMPARED WITH DIRECT MEASUREMENTS
Michael P. Clancy May 1970 35 p refs
(Contract Nonr-285(57))
(AD-713167; GSL-TR-70-6) Avail: NTIS CSCL 8/3

Seven days of turbulence measurements made from a thrust anemometer were analyzed. Parametric representations of the wind stress were obtained from the drag law and from the dissipation or spectrum method. These were compared with simultaneous direct measurements of wind stress. It was found that the spectrum method was superior. Author (TAB)

N71-15440# Battelle Memorial Inst., Columbus, Ohio.
STATIC DETERMINATION OF THE EQUATION-OF-STATE OF CEDAR CITY TONALITE Final Report
Phillip N. La Mori Washington DASA May 1970 72 p refs
(Contract DASA01-69-C-0053)
(AD-713175; DASA-2527) Avail: NTIS CSCL 8/7

Static compressibility measurements were made on samples of Cedar City tonalite of nominal densities of 2.37, 2.54, and 2.61 g/cc. The purpose of these measurements was to provide equation-of-state data for code calculations. Water-saturated and dry samples were cycled to 0-12-0-24-0-38-0 kb in a piston-cylinder solid pressure media apparatus. The effect of cycling the dry samples caused the denser samples to expand on cycling; the low density sample showed a large, permanent negative strain after the 0-12 kb cycle. Further crack closure on cycling was elastic. At 40 kb the samples were approaching a density which suggested all the cracks and pores had been removed. The saturated samples behaved much differently than the dry samples. Their delta V was less, their hysteresis was less and their compressibility curves reproduced on cycling. Hydrostatic cycling experiments were made to 9 kb using axially and circumferentially mounted strain gages on copper-jacketed rock cylinders. The rocks showed permanent set to pressures of 1 kb. Above 1 kb the cracks and pores appeared to be removed elastically. With a few notable exceptions, the linear compressibilities of all the samples were within 10 percent of each other. Thus, with these exceptions and the exclusion of the lower density (2.37 g/cc) material, the rock seems generally homogenous and isotropic elastically. Author (TAB)

N71-15455# Gulf Universities Research Corp., Galveston, Tex.
A STUDY OF ECONOMIC VALUE OF INCREASED ESSA SERVICES AS RELATED TO ESTUARINE DYNAMICS IN GULF COAST ESTUARIES, VOLUME 2
Thomas E. Hawkins (Southwest Res. Inst.) 28 Jan. 1970 178 p refs Sponsored by ESSA
(PB-194077) Avail: NTIS CSCL 08H

Contents: The need for knowledge of estuarine dynamics; (Need for mass flow measurements; need for water level measurements; need for water temperature measurements; need for a systems approach); Over-all program concepts; (The instrumentation concept; the model concept); Program and program costs; (Galveston Bay program definition; Galveston Bay program costs; long-term program and program costs). USGRDR

N71-15458# Finnish Meteorological Office, Helsinki.
MAGNETIC RESULTS FROM NURMIJAERVI GEOPHYSICAL OBSERVATORY, 1969
1970 41 p
(Rept-11) Avail: NTIS

The magnetic measurements were made using normal, high-speed, and insensitive registration. Absolute measurements of the vertical and horizontal components were taken with a vector proton magnetometer. The absolute level of declination was determined with two theodolites. In July 1969 the Nurmijaervi standards were compared with the Rude Skov observatory standards; no difference was found in declination and the vertical component, but a difference of +1 gamma was found between the two stations. The results of the absolute measurements and the base lines used are given graphically. R.B.

N71-15459# Texas A&M Univ., College Sation.
ANNOTATED BIBLIOGRAPHY OF RESOURCE USE, TEXAS GULF COAST
Clare A. Gunn Nov. 1969 392 p refs Sponsored in part by NSF
(PB-189780; Publ-204) Avail: NTIS CSCL 05C

Recent concern by the state of Texas over its coastal resources and accompanying development exposed the need for identifying current and past studies about this geographical region. The bibliography is the result of collecting, reviewing, recording, annotating and classifying as many studies as could be found. Author (USGRDR)

N71-15480# Miami Univ., Fla. Rosenstiel School of Marine and Atmospheric Sciences.
ABSOLUTE DATING OF OCEAN SEDIMENTS BY USE OF Th-230/Pa-231 RATIO AND GEOCHEMICAL STUDIES OF LIMITING BOUNDARY CONDITIONS WITH SPECIAL ATTENTION TO EXOTIC ENVIRONMENTS Annual Progress Report
Elizabeth Rona Aug. 1970 7 p refs
(Contract AT(40-1)-3622)
(ORO-3622-9) Avail: NTIS

One deep sea core from the central Caribbean was dated by C-14 and Pa-231/Th-230 methods. The ages obtained were in good agreement with the ages previously obtained for other cores. Sediment cores from the Cariaco Trench were analyzed, and a high U concentration was found. Fossil marine carbonates from the Afar depression between Ethiopia and the Red Sea were studied to develop a geochronology of the region. Tenative ages of the deposits are given. NSA

N71-15481# Army Engineer Topographic Labs., Fort Belvoir, Va.
A MATHEMATICAL ANALYSIS OF THE PROPAGATION AND REFLECTION OF PLANE ELECTROMAGNETIC WAVES IN A NONHOMOGENEOUS ISOTROPIC MEDIUM
Richard A. Hevenor 1970 13 p refs
(AD-713539) Avail: NTIS CSCL 20/14

Considerable work has been accomplished in the area of analyzing the reflection and refraction of plane electromagnetic waves at a plane surface boundary, where the electrical parameters of the mediums under investigation are constants. In the area of Military Geographic Intelligence there exists a need to determine terrain surface and subsurface phenomena by the use of remote sensors. There is also a need to understand the consequence of nonhomogeneous soil mediums on the return energy going to a remote sensor such as a side looking airborne radar system. These needs can be fulfilled efficiently only when an understanding of the propagation and reflection of electromagnetic waves from natural terrain surfaces has been achieved. The understanding can be aided by solving the vector wave equation for the case where the soil conductivity and dielectric constant are functions of soil depth. Author (TAB)

N71-15483# Research Inst. of National Defence, Stockholm (Sweden).
HAGFORS SEISMOLOGICAL OBSERVATORY IN SWEDEN
U. Ericsson Sep. 1969 8 p
(FOA-4-C-4400-20) Avail: NTIS

The seismologic array station, comprised of three substations, is described briefly in terms of instrumentation, recording input and output equipment process control, calibrating, and data processing and dissemination activities. E.C.

N71-15488# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Munich (West Germany)
MEASUREMENT OF MOLECULAR AND AEROSOL BACKSCATTER FROM THE STRATOSPHERE BY GROUND BASED RUBY-LASER [DIE MESSUNG DER RUECKWAERTSSTEUUNG AN MOLEKUELEN UND AEROSOLEN IN DER STRATOSPHAERE MITTELS RUBIN-LASERSTRAHLEN VOM BODEN AUS]
Hans-Joachim Katerle (Ph.D. Thesis – Ludwig-Maximilian-Univ.) 1969 120 p refs In GERMAN; ENGLISH summary
Avail: NTIS

The basic equations for the measurement of molecular and aerosol backscatter in the free atmosphere are derived. The relative measurement of the scattered light flux as a function of the altitude does not give any information about the vertical aerosol distribution. But the ratio of the measured light flux to the light flux as calculated from pure molecular scattering can be given. The equipment of the measurement is described. Ground based measurements of the backscatter were carried out for altitudes between 10-50 km. Twelve of the fifteen measured vertical profiles were evaluated. Author

N71-15497# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
FOREST AND RANGE INVENTORY AND MAPPING
Robert C. Aldrich [1970] 30 p refs
Avail: Issuing Activity

Applications and uses of remote sensing techniques for forest sampling and mapping are discussed. Methods include aircraft, spacecraft, and electronic sensors. A comparison of sampling and probability sampling theories shows probability sampling has the advantages of (1) eliminating costly ground samples, (2) being more efficient, (3) providing unbiased estimates, (4) providing statistically valid sampling errors at all stages, and (5) improving operational efficiency. Sample photographs are included. E.H.W.

N71-15501# Bureau of Mines, Washington, D.C.
MICROSEISMIC AND DISPLACEMENT INVESTIGATIONS IN AN UNSTABLE SLOPE
Raymond M. Stateham and John S. Vanderpool Jan. 1971 25 p refs
(BM-RI-7470) Avail: Issuing Activity

Microseismic noise rates and slope movements were measured in an unstable area along the north wall of the Tripp-Veteran pit. Low noise, wideband microseismic geophones were located at various points in the wall, and the changes in distances across open fractures, resulting from instability, were determined by repeated measurements between fixed points set on each side of the fractures. The microseismic noise rate increased and decreased with corresponding increases and decreases in the rate at which the fractures opened. The microseismic noise rates and changes in width of the fractures show excellent agreement, and the two types of measurements complement each other in monitoring the progress of pit wall failure. Author

N71-15502# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
DETECTION AND CHARACTERIZATION OF STRESS SYMPTOMS IN FOREST VEGETATION
Robert C. Heller [1969] 55 p refs
Avail: NTIS

Aerial color photography was used to detect and locate areas of forest timber under vegetative stress caused by bark beetles. Evaluated were combinations of films, scales, and filters for remote sensing of injured trees from aircraft and the possibility to detect stressed trees before visual symptoms of decline occurred. Infrared multispectral line scanner photos were interpreted for small scale color and infrared color transparencies of foliage and compared with ground observations. It was concluded that stress induced on forest vegetation is best detected when symptoms exhibit foliage discoloration by using color or false-color photography. G.G.

N71-15503# Joint Publications Research Service, Washington, D.C.
SOVIET GRAVIMETRIC WORK, 1966–1969
5 Jan. 1971 17 p refs Transl. into ENGLISH from Russian report
(JPRS-52102) Avail: NTIS

Work in the field of gravimetry was conducted in the following sections: (1) basic determination of gravity force; (2) determination of gravity force at sea; (3) investigation of variations of gravity force; (4) development of instrumentation and methods for determining the vertical gradient of gravity force; and (5) tidal variations of gravity force. Author

N71-15504# American Meteorological Society, Washington, D.C.
COOPERATIVE INVESTIGATION OF THE CARIBBEAN AND ADJACENT REGIONS (CICAR). BIBLIOGRAPHY ON METEOROLOGY, CLIMATOLOGY, AND PHYSICAL/CHEMICAL OCEANOGRAPHY. VOLUME 1
1970 390 p Sponsored by Natl. Oceanog. Data Center.
(AD-713492) Avail: NTIS; Naval Oceanog. Office, Washington, D.C.: $7.00 CSCL 4/2

The abstracted bibliography has been compiled from the files of the Meteorological and Geoastrophysical Abstracts Office of the American Meteorological Society AMS and from files of Government libraries in the Washington, D. C., area. Its purpose is to provide the participants of CICAR with a reasonably comprehensive and timely review of the published literature in physical/Chemical oceanography and in meteorology/climatology concerned with the Caribbean Sea, Gulf of Mexico, Greater and Lesser Antilles Regions, and the adjacent coastal areas of North, Central, and South America. Articles dealing with weather phenomena outside of this geographical region, but in-

fluencing the atmosphere within the area, have been included occasionally. Similarly, references to oceanographic region, but influencing the atmosphere within the area, have been included occasionally. Similarly, references to oceanographic cruise data taken outside of but close to this area were also sometimes included. Author (TAB)

N71-15505# American Meteorological Society, Washington, D.C.
COOPERATIVE INVESTIGATION OF THE CARIBBEAN AND ADJACENT REGIONS (CICAR). BIBLIOGRAPHY OF METEOROLOGY, CLIMATOLOGY, AND PHYSICAL/CHEMICAL OCEANOGRAPHY, VOLUME 1, INDEXES
1970 240 p refs
(AD-713493) Avail: NTIS; Naval Oceanog. Office, Washington, D.C.: $6.00 CSCL 4/2

The report includes a subject index on meteorology; a meteorological geographical index; a oceanography subject index; a oceanography geographical index; and an author index, compiled from data from the U. S. National Oceanographic Center on the Caribbean Sea and adjacent regions. TAB

N71-15506# Scott Research Labs., Inc., Plumsteadville, Pa.
THE 1969 ATMOSPHERIC REACTION STUDIES IN THE LOS ANGELES BASIN. VOLUME 1: PROGRAM DESIGN AND METHODOLOGY DATA SUMMARY AND DISCUSSION Final Report, 18 Aug.–14 Nov. 1969
16 Feb. 1970 211 p refs Sponsored in part by Coordinating Res. Council, New York
(Contract PHS-CPA-70-6)
(PB-194061; Rept-1142) Avail: NTIS CSCL 13B

A comprehensive survey of the atmosphere of the Los Angeles Basin was conducted. A large number of contaminants were determined continuously and periodically, and readings of pertinent meteorological factors were made at two ground level sites and in vertical profiles above the ground sites. The following areas are discussed: (1) the equipment and methodology used in conducting the study; (2) the program design and test operations; (3) the data file collected during test operations; (4) an evaluation of the instrumentation and procedures used in the program, (5) a summary of chemical parameters measured at the ground sites; (6) an explanation of the data obtained for September 20 and the interrelationship between the data from the various program phases; and (7) miscellaneous observations regarding interesting or unusual occurrences. Author (USGRDR)

N71-15507# Scott Research Labs., Inc., Plumsteadville, Pa.
ATMOSPHERIC REACTION STUDIES IN THE LOS ANGELES BASIN, 1969. VOLUME 2: COMMERCE GROUND DATA Final Report, 18 Aug.–14 Nov. 1969
16 Feb. 1970 531 p
(Contract PHS-CPA-70-6)
(PB-194062) Avail: NTIS CSCL 13B

Data for the chemical and meteorological parameters measured at the Commerce ground site during the period from August 18 to November 14, 1969. Averages are given from ten minute time periods with each page covering six hours. Data from continuous instruments were normally recorded at one minute intervals during daytime working hours and at ten minute intervals overnight. Periodic data are inserted into the appropriate time periods. Author (USGRDR)

N71-15508# Scott Research Labs., Inc. Plumsteadville, Pa.
ATMOSPHERIC REACTION STUDIES IN THE LOS ANGELES BASIN, 1969. VOLUME 3: EL MONTE GROUND DATA Final Report, 18 Aug.–14 Nov. 1969
16 Feb. 1970 451 p
(Contract PHS-CPA-70-6)
(PB-194063) Avail: NTIS CSCL 13B

Data for the chemical and meteorological parameters measured at the El Monte ground site during the period from August 18 to November 7, 1969 are presented. Averages are given for ten minute time periods with each page covering six hours. Data from continuous instruments were normally recorded at one minute intervals during daytime working hours and at ten minute intervals overnight. Periodic data are inserted into the appropriate time periods. Author (USGRDR)

N71-15509# Scott Research Labs., Inc., Plumsteadville, Pa.
ATMOSPHERIC REACTION STUDIES IN THE LOS ANGELES BASIN, 1969. VOLUME 4: AIRBORNE DATA ESSA COOPERATIVE DATA Final Report, 18 Aug.–14 Nov. 1969
16 Feb. 1970 308 p
(Contract PHS-CPA-70-6)
(PB-194064) Avail: NTIS CSCL 13B

Data for the chemical and meteorological parameters measured aloft during the 26 aircraft flights and for analyses performed on the Tedlar bag samples collected during vertical profiles are presented. The data from the continuous instruments were recorded at ten second intervals during profiles and at one minute intervals at other times. Occasional spurious readings, usually caused by interfering signals, must be disregarded. The first four flights were made before all the instrumentation was operational and were used for check-out purposes. Asterisks are placed between the UV columns when the aircraft was in level flight. Other UV readings are not necessarily valid. Altitudes recorded by the transducer have been corrected for barometric pressure and instrument error by empirical equations, and most residual errors are less than 50 feet. Author (USGRDR)

N71-15520# Toulouse Univ. (France). Faculte des Sciences.
RADON DETECTION IN THE SEA AND THE ATMOSPHERE [DETECTION DU RADON DANS LA MER ET DANS L'ATMOSPHERE]
Yvan Delos (Ph.D. Thesis) Jun. 1970 104 p refs In FRENCH
(NP-18404) Avail: AEC Depository Libraries

An apparatus for the measurement of low quantities of Rn-222 in air, or in water, using the adsorption on activated carbon was developed. Two precise problems were investigated with the apparatus. On one hand, the aircraft measurement of Rn-222 was made. This method allows freedom of the equilibrium state between Rn and its daughters. On another hand, the measurement of Rn dissolved in sea water, for studying the Rn flow at sea–air interface, was made. Measurements made in the Mediterranean Sea along the coasts showed that the Rn profiles were very variable, and related to the motions of water. NSA

N71-15521# Stanford Univ., Calif. Dept. of Civil Engineering.
LABORATORY INVESTIGATIONS ON AIR-SEA INTERACTIONS
En Yun Hsu and Hsi Yen Yu Aug. 1970 42 p refs
(Contract Nonr-225(71); Grant NSF GK-2506)
(AD-713469; TR-137) Avail: NTIS CSCL 8/3

Since the comprehensive review on wind wave generation by Ursell in 1956, there have been renewed, intensive studies, theoretical as well as experimental on the subject. Although significant contributions have been made by many investigators, the final goal of achieving a basic understanding of the fundamental mechanism of energy transfer between a turbulent air stream and the ocean has not been realized. The dearth of systematic measurements taken under controlled conditions closely comparable to those of Miles model was a motivation for our research program. Experiments were designed for measuring the wave induced perturbation pressure under steady-state and unsteady-state

conditions. Other experiments were also devised for measuring growth of mechanically generated waves subjected to wind action. This paper presents a summary of the Stanford experimental data in the inviscid range, compares the Stanford data and other existing data to the theory, and suggests specific and fruitful avenues for further study. Author (TAB)

N71-15522# National Oceanographic Data Center, Washington, D.C.
COMPUTER PROGRAMS IN OCEANOGRAPHY, REVISED
C. Dinger, comp. 1970 146 p refs Revised
(AD-713491; NODC-PUB-C-5-Rev-2) Avail: NTIS; Natl. Oceanog. Data Center: $1.35 CSCL 8/10

Contents: Program abstracts, by category; Biological oceanography, chemical oceanography, data reduction, editing and special input/output, geoscience, graphical display, mathematics, applied; navigation and charting; physical oceanography; retrieval of ocean data. TAB

N71-15523# National Oceanographic Data Center, Washington, D.C.
ENVIRONMENTAL DATA FROM AN/SMT-1 NOMAD N3S GULF OF MEXICO. PROJECT SEA SENSE Progress Report
S. J. Halminski, K. R. Avery, and D. La Mar Sep. 1970 179 p refs
(AD-713479; NODC-PUB-P-97) Avail: NTIS CSCL 4/2

The purpose of the report is to display, in climatic form, environmental data collected from one of many Navy operated unmanned marine automatic buoys, the AN/SMT-1 NOMAD (Navy Oceanographic Meteorological Automatic Device) N3S. During 1968, NOMAD N3S was located in the Central Gulf of Mexico at 25.1 degrees N. and 89.9 degrees W, where the water depth is approximately 11,000 feet. Author (TAB)

N71-15524# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
CORRELATION OF MOVEMENTS IN THE WESTERN NORTH ATLANTIC
Donald V. Hansen May 1970 22 p refs
(ESSA-TR-ERL-164-AOML-1) Avail: SOD $0.30

A search was made for correlation of current meter records, movement of geostrophic eddies, and Swallow float measurements with Gulf Stream meandering. Data of all these kinds are two few to permit strong conclusions, but some evidence is found indicating that passage of Gulf Stream meanders is accompanied by fluctuations of meridional flow extending an indeterminate distance outside the stream. Author

N71-15525# California Univ., La Jolla. Scripps Inst. of Oceanography.
INDEX TO SIO SEISMIC DATA IN THE PACIFIC OCEAN
Paul Liebertz [1970] 43 p Sponsored by NSF, Navy, Pan-Am. Petrol. Found., and Chevron Oil Field Res. Co. *Its* Ref. No. 70-10
(PB-192332; Publ-1) Avail: NTIS CSCL 08J

The accompanying charts and tables are intended to provide a rapid indexing system for locating available seismic reflection profiling and seismic refraction data in the Pacific Basin. Author (USGRDR)

N71-15533*# Walden Research Corp., Cambridge, Mass.
MULTIVARIATE REGRESSION ANALYSIS OF ATMOSPHERIC DENSITY IN THE REGION 30 TO 110 km
Paul Morgenstern and Ronald G. Orner Oct. 1970 135 p refs
(Contract NAS12-2125)
Avail: NTIS CSCL 04A

Density-altitude profiles from 437 rocket soundings for various portions of the altitude interval 30 to 200 km have been statistically studied for the detection of systematic time and space variations. The investigation also considered possible relationships between upper atmospheric density changes and variations in electromagnetic and corpuscular solar radiation. Multivariate regression analysis techniques were used to test for significant independent variables and to develop empirical prediction equations. Below 65 km, seasonal effects weighted by latitude account for almost all significant density variations. There is a mid-region at about 65 km where diurnal as well as seasonal effects explain most of the variation, and at the high altitude region above 75 km, extraterrestrial effects appear to become more important. The seasonal variations show a lag effect which decreased with height from 30 to 65 km. The diurnal variations near 65 km indicate a latitude dependence with peak densities near midnight at high latitudes and near midday at low latitudes. Author

N71-15534# Illinois Univ., Urbana. Aeronomy Lab.
MONTE CARLO AND THOMSON-SCATTER PLASMA-LINE STUDIES OF IONOSPHERIC PHOTOELECTRONS
R. J. Cicerone and S. A. Bowhill 1 Sep. 1970 230 p refs *Its* Aeronomy Rept. No. 39
(Grant NSF GA-15526)
(UILU-Eng-70-262) Avail: Issuing Activity

Ionospheric photoelectrons were studied by two methods, one experimental and one theoretical. The experimental portion of the investigation utilized radar Thomson scatter plasma-line data collected at the Millstone Ionospheric Observatory on February 9, 1969. A Monte Carlo Numerical technique was developed which included all of the important physical processes for ionospheric photoelectrons. This technique was applied to perform theoretical studies of photoelectron flux parameters in the upper F-region for two model atmospheres. In addition to calculating the altitude, energy, and pitch-angle dependences of the F-region fluxes, the Monte Carlo computations also obtained the daytime escape flux of photoelectrons into the magnetosphere. The Monte Carlo results were also used to solve several problems which arose in the reduction of plasma-line data. These problems were discussed in detail and were resolved before the plasma-line data was interpreted in terms of photoelectron fluxes. In this way, experimental estimates were obtained of the daytime escape flux of photoelectrons, and of the escaping energy flux. The magnitudes of these fluxes, as measured in the plasma-line experiments, were found to be good agreement with those computed by the Monte Carlo technique. Author

N71-15541# National Science Foundation, Washington, D.C.
RADIOPHYSICAL METHODS OF RESEARCH IN THE ARCTIC OCEAN AND ANTARCTICA [RADIOFIZICHESKIE METODY V ISSLEDOVANIYAKH SEVERNOGO LEDOVITOGO OKEANA I ANTARKTIKI]
V. V. Bogorodskii 1970 218 p refs Transl. into ENGLISH from Tr. Arkticheskogo i Antarkt. Nauchn.-Issled. Inst. (Leningrad), v. 284, 1968
(TT-69-55083) Avail: NTIS CSCL 08J

Radiophysical methods of research in the Arctic and Antarctic oceans are discussed. Subjects presented are: (1) computation of a sound field in layered inhomogeneous media, (2) radiophysical study of ice dynamics, (3) radio emission of heat from ice cover, (4) radio interference methods for determining ice thickness, (5) dielectric properties of ice, and (6) statistical characteristics of signals from water surfaces and ice formations recorded by airborne actinometers. Author

N71-15544# New South Wales Univ., Kensington (Australia).
RESEARCH AND PUBLICATIONS, 1969
1970 135 p refs
Avail: NTIS

Research progress is reported on the following topics: applied geology, chemical engineering, geography, metallurgy, mining

engineering, textile technology; civil, electrical, highway, mechanical, industrial, nuclear, and traffic engineering; applied physics and optometry, and applied mathematics. R.B.

N71-15546# Comissao Nacional de Atividades Espacias, Sao Jose dos Campos (Brazil). Conselho Nacional de Pesquisas.
REMOTE SENSORS PROJECT: GEOGRAPHY AND URBANISM, VOLUME 2 Final Report of Phase C [PROJETO SENSORES REMOTOS: GEOGRAFIA E URBANISMO, VOLUME 2 (RELATORIO FINAL DA FASE 'C')]
Aida O. Ferreira de Barros Sep. 1970 88 p refs In PORTUGUESE
(LAFE-133-Vol-2) Avail: NTIS

The verification of the geography in the Rio de Janiero region by the use of airbourne remote sensing equipment is presented as part of a global program to survey surface gradients and other natural resources. The observed data for selected test areas are analyzed. Transl. by F.O.S.

N71-15594+ Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie und Geophysik.
METEOROLOGICAL DATA. VOLUME 112, NO. 3: RESULTS FROM THE SYNOPTIC SERVICE DURING 1970. DAILY WEATHER MAPS (GROUND, 500 mb, 300 mb) AND BRIEF SCIENTIFIC REPORTS. MARCH
Manfred Geb, Leopold Klauser, and Richard Scherhag 1970 178 p refs
Avail: NTIS

Daily weather charts presented contain meteorological parametric data from several atmospheric levels of the Northern Hemisphere obtained during March, 1970. Also included are snow reports from German and Austrain winter sport centers and climatological data for the vicinity of Berlin, Germany. Brief scientific reports attached cover anticyclone formation in Scandinavia, weather prediction for Central Europe, theoretical and synoptic analyses of a mesoscale, and winter anomalies in Japan. Transl. by G.G.

N71-15612# Southwest Research Inst., San Antonio, Tex.
TOMORROW THROUGH RESEARCH: UNDERSEA POWER EXTENSION
1970 8 p
Avail: Issuing Activity

An underwater electrical connector and cable system was designed and developed to deliver large amounts of electrical power for use underwater. The system can transmit electricity at 4,160 volts, in contrast to the present maximum capability of about 440 volts for systems terminating underwater. A three-phase system rated for 59 amperes of current per phase, it can be used as deep as 6,000 feet below the ocean surface. The connector system is designed so that it can be expanded, without conceptual change, to operate at 15,000 volts, and to deliver up to 1,000,000 watts of power. Author

N71-15629# Illinois Univ., Urbana. Aeronomy Lab.
LUNAR SEMIDIURNAL COMPONENT OF THE OI(5577A) AIRGLOW
J. M. Forbes and M. A. Geller 15 Oct. 1970 80 p refs *Its* Aeronomy Rept. No. 40
(Grant NSF GA-14232)
(UILU-ENG-70-263) Avail: Issuing Activity

The effect of lunar tidal dynamics on the OI(5577A) airglow is studied for the Chapman reaction, Barth's mechanism, and the F-region contribution to the green line intensity. The Barth mechanism is found to agree more favorably with observations of lunar tide variations of the oxygen green line. The F-region contribution is found to be of roughly the same order as the lunar variation that is calculated for the E-region. It is concluded that the dynamics of the lunar tide is probably sufficient to produce a lunar variation in green line airglow similar to that which is observed. Author

N71-15636# Water Resources Engineers, Inc., Walnut Creek, Calif.
EROSION CONTROL ON AIR FORCE BASES, JANUARY 1969 – JULY 1970
Delynn R. Hay, D. F. Kibler, and C. E. Busby Kirtland AFB, N.Mex. AFWL Aug. 1970 25 p refs Presented at Am. Soc. of Agron. Ann. Meeting, Tuscon, Ariz., 24-28 Aug. 1970
(Contract F29601-69-C-0039)
(AD-713644; WLC-TN-70-018) Avail: NTIS

A state-of-the-art review of the soil erosion field as it relates to the erosion control needs of the US Air Force was conducted. The review will serve as a guide for preparation of a Base Civil Engineer erosion control handbook. Typical military construction activities which have exposed large areas of unprotected soil and subsequently have led to serious erosion problems are presented. Factors involved in the wind and erosion processes are discussed and soil-loss equations and soil erodibility indices are reviewed. The erodibility K-factor in the ARS soil-loss equation is evaluated for land management planning techniques. Guidelines for effective erosion control practices to protect exposed land surfaces against soil particle detachment and transport by either water or wind are presented. Further efforts to establish a more reliable erodibility index which can be used to define areas of highly erodible soils, especially for subsurface soils that are exposed during construction are indicated. Author (TAB)

N71-15652# National Science Foundation, Washington, D.C. Special Foreign Currency Science Information Program.
SEISMIC EQUIPMENT FOR RAPID TSUNAMI-WARNING SYSTEM [SPETSYALNAYA BISTRODFISTVUYUSHCHAYA SEISMICHESKAYA APPARATURA DLYA OPOVESHCHENIYA O TSUNAMI]
D. P. Kirnos and A. V. Rykov 1970 11 p refs Transl. into ENGLISH of Russian Monograph
(TT-70-50124) Avail: NTIS CSCL 08C

The seismic method used in warning systems for tsunamis is discussed. When a seismograph makes a recording, the coordinates of the epicenter and the magnitude of the earthquake are determined. If the epicenter is in a tsunami region, and if the magnitude of the earthquake is sufficient to represent a tsunami danger, a warning signal is given. At present time, seismic observations for the tsunami-warning service are made on the Pacific coast of the U.S.A., in the Hawaian Islands, and in Japan. The tsunamis that threaten the Pacific coast of the U.S.A. and the Hawaiian Islands originate mainly at points distant from these shores, and the waves travel for a considerable time (more than an hour) before reaching the shore. This simplifies the implementation of a tsunami-warning system based on seismic stations, equipped with seismographs making a visible record, with mechanical registration systems, and intended for the detection of distant earthquakes. A warning of a possible tsunami is issued to the population, approximately an hour after the start of an earthquake. Author (USGRDR)

N71-15668# Israel Program for Scientific Translations, Ltd., Jerusalem.
THERMAL INTERACTION OF THE ATMOSPHERE AND THE HYDROSPHERE IN THE ARCTIC
Yu. P. Doronin and E. P. Borisenkov, ed. 1970 252 p refs Transl. into ENGLISH of the book 'Teplovoe Vzaimodeistvie Atmosfery i Gidrosfery v Arktike' Leningrad, Gidromet Eorologicheskoe, 1969 p 1–244 Sponsored by NSF
(TT-70-50091) Copyright. Avail: NTIS CSCL 04A

Thermal interaction between the atmosphere and hydrosphere in the Arctic, and processes developing in these media due to heat exchange are estimated quantitatively. Due to the fact that the ice cover plays an important role in the exchange of heat and is itself a product of the latter, and due to the need to know conditions for the formation, growth, and disintegration of ice for navigation

purposes, these problems are dealt with extensively. The use of high-speed electronic computers in modern hydrometeorological computations is a new and more precise approach to the determination of elements of convective mixing in the sea, to the calculation of dates of ice formation, growth, and melting, to the effect of heat exchange with the ocean on the temperature and baric field of the atmosphere, and to the solution of other problems.
Author

N71-15670# Institute for Telecommunication Sciences, Boulder, Colo.
IONOSPHERIC PREDICTIONS FOR APRIL 1970
Jan. 1970 35 p refs
(TB-11-499-85/TO-31-3-28-2) Avail: SOD $0.35

Predicted coefficients defining the numerical map functions for the worldwide variation of foF2 and M(3000)F2 are presented in table form; also provided is the basic prediction for F2 layer propagation. The predicted sunspot number for April 1970 is included together with previous observed and predicted Zurich smoothed relative sunspot members.
Author

N71-15671# Geological Survey, Washington, D.C. Paleontology and Stratigraphy Branch.
CONTRIBUTIONS TO GENERAL GEOLOGY: GEOLOGIC INTERPRETATION OF RECONNAISSANCE AEROMAGNETIC SURVEY OF NORTHEASTERN ALASKA
William P. Brosge, Earl E. Brabb, and Elizabeth R. King GPO 1970 100 p refs
(Bull-1271-F) Avail: SOD

Aeromagnetic reconnaissance of northeastern Alaska in 1965 covered approsimately 100,000 square miles, from lat 64° N. to the Arctic Ocean and from the Alaska-Yukon boundary to long 148°30' W. A magnetic contour map was compiled from data from the 1965 survey and earlier surveys. On the basis of these data, northeastern Alaska may be divided into five areas, each having a distinct magnetic character. A study of specific anomalies within these areas led to the tracing of such features as the Tintina fault zone, Ruby uplift, and Kobuk trench for more than 100 miles. Other features, such as inferred north-trending faults and serpentine belts, had not been identified previously by surface geologic methods. The probable extension of volcanic rocks beneath the Yukon Flats limits the size of a possible Tertiary petroleum basin. Discovery of large magnetic anomalies in the Yukon-Tanana Upland provides new possibilities for exploration for mineral deposits associated with ultramafic rocks.
Author

N71-15672# Alaska Univ., College. Geophysical Inst.
BIBLIOGRAPHY OF PUBLICATIONS, 1948 - 1970
Oct. 1970 78 p refs
Avail: NTIS

Publications listed in the bibliography are divided into the following three series: (1) reprints of papers that appear in scientific journals; (2) numerical data of high latitude geophysical phenomena; and (3) scientific and technical reports issued by the Geophysical Institute on all contracts and grants.
Author

N71-15680# Joint Publications Research Service, Washington, D.C.
OCEANOGRAPHY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 241 27 Nov. 1970 p 20-25 refs (See N71-15677 05-30)
Avail: NTIS

A news release on Soviet research in the Atlantic Ocean is briefly reviewed. Abstracts on various oceanographic literature are also presented, including sound scattering by the ocean floor, cyclicity of water temperature variations in the North Atlantic, and unsteady drift currents in deep ocean.
J.A.M.

N71-15681# Joint Publications Research Service, Washington, D.C.
TERRESTRIAL GEOPHYSICS
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 241 27 Nov. 1970 p 26-32 refs (See N71-15677 05-30)
Avail: NTIS

A pulsed exciter of elastic waves consisting of an electric energy converter and a wave sensor is briefly discussed. Abstracts on various geophysical literature are cited, including mohorovicic discontinuity of east Russian platform, interpreting gravity anomalies in transitional zones, and underground radio wave methods.
J.A.M.

N71-15682# Joint Publications Research Service, Washington, D.C.
UPPER ATMOSPHERE AND SPACE RESEARCH
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 241 27 Nov. 1970 p 33-47 refs (See N71-15677 05-30)
Avail: NTIS

The launchings of Cosmos 375 and 376 satellites and the splash down of Zond 8 are announced. Excerpts from a press conference on the Luna 16 mission are reported, emphasizing the chemical analysis of lunar soils. Abstracts on various atmospheric and aerospace literature are also included.
J.A.M.

N71-15683# Joint Publications Research Service, Washington, D.C.
[MISCELLANEOUS: POLAR REGION RESEARCH]
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 241 27 Nov. 1970 p 48-49 refs (See N71-15677 05-30)
Avail: NTIS

A Soviet news release on the publication of a two volume atlas of Antarctica is presented, and the termination of experimental work on the drifting station SP-19 is also mentioned.
J.A.M.

N71-15684# Weapons Research Establishment, Salisbury (Australia).
IONOSPHERIC DATA FOR OCTOBER 1969 FROM SALISBURY, SOUTH AUSTRALIA
Jun. 1970 28 p refs
(SAD-1969/10(S)) Avail: NTIS

Tables of the hourly values of the customary ionospheric parameters are given for the station at Salisbury for October 1969.
Author

N71-15685# Weapons Research Establishment, Salisbury (Australia).
IONOSPHERIC DATA FOR SEPTEMBER 1969 FROM SALISBURY, SOUTH AUSTRALIA
Jun. 1970 28 p refs
(SAD-1969/9(S)) Avail: NTIS

Tables contain the hourly ionospheric measurements obtained by the station at Salisbury for September 1969. A new versatile ionospheric recorder was used for measuring.
G.G.

N71-15690# Weapons Research Establishment, Salisbury (Australia).
IONOSPHERIC DATA FOR DECEMBER 1969 FROM SALISBURY, SOUTH AUSTRALIA
Jun. 1970 28 p refs *Its* Ionospheric Data Bull. SAD 1969/12(S)
Avail: NTIS

Tables of the hourly values of the customary ionospheric parameters are given for the station at Salisbury for December 1969.
Author

N71-15691# Weapons Research Establishment, Salisbury (Australia).
IONOSPHERIC DATA FOR NOVEMBER 1969 FROM SALISBURY, SOUTH AUSTRALIA

Jun. 1970 28 p refs
(SAD-1969/11(S)) Avail: NTIS

Tables of the hourly values of the customary ionospheric parameters are given for the station at Salisbury for November, 1969. Author

N71-15693# National Ocean Survey, San Francisco, Calif. Seismological Field Survey.
ABSTRACTS OF EARTHQUAKE REPORTS FOR THE UNITED STATES, JULY–SEPTEMBER, 1969
Rockville, Md. Dec. 1970 23 p
(NOAA-NOS-MSA-143) Avail: Issuing Activity

Abstracts of earthquake reports for the United States, Panama Canal Zone, Puerto Rico, and the Virgin Islands are given. An illustration of the eastern Tennessee earthquake is included. E.H.W.

N71-15694* National Aeronautics and Space Administration, Washington, D.C.
EARTH OBSERVATIONS PROGRAM REVIEW, 4–5 NOVEMBER 1969
5 Nov. 1969 95 p
(NASA-TM-X-66568) Avail: Available to NASA Offices and Centers from the NASA Facility. All other requests for the document must be forwarded to Earth Observations Div., Code SR, NASA Headquarters, Wash., D.C. 20546 CSCL 08E

Current programs are reviewed and possibilities developed for the survey of earth resources and monitoring weather. Supporting research and technology contributing to the advancement and applications of these programs are discussed. Author

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N71-14780# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
INSTRUMENTATION AND DROP-TESTING TECHNIQUES FOR INVESTIGATING FLIGHT VEHICLES AND PERSONNEL PROTECTIVE SYSTEMS
Richard Carpenter, Milton O. Thompson, and Joseph H. Bowers (Northorp Corp). Washington Jan. 1971 19 p refs
(NASA-TM-X-2149; H-621) Avail: NTIS CSCL 14B

A vehicle and flight systems dynamic impact laboratory, with appropriate instrumentation, was constructed recently at the NASA Flight Research Center. The purpose of the laboratory is to investigate energy-absorbing characteristics of various flight vehicle configurations and personnel protection and restraint systems during low-energy impacting. The laboratory was designed to permit investigation of a large range of horizontal and vertical impact velocities that would occur in low-level crash situations. It has provided acquisition of dynamic structural data on both vehicle configurations and personnel protection and restraint systems during low-energy impacting. The laboratory was designed to permit investigation of a large range of horizontal and vertical impact velocities that would occur in low-level crash situations. It has provided acquisition of dynamic structural data on both vehicle configurations and personnel restraint systems. Author

N71-14788# California Inst. of Tech., Pasadena.
REMOTE-READING BOREHOLE INCLINOMETER Final Report
B. Kamb and C. F. Raymond 13 Aug. 1970 8 p
(Grant NSF GA-1051X1)
(PB-193925) Avail: NTIS CSCL 14B

A new type of inclinometer, having an electrical output which can be read remotely from the surface so that complete logging of a hole can be accomplished with only one lowering of the instrument, is described. Author (USGRDR)

N71-14798*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELECTRON OPTICAL METALLOGRAPHIC INSTRUMENTS
C. W. Andrews [1970] 36 p refs
(NASA-TM-X-52949; E-6108) Avail: NTIS CSCL 14B

Some principles, characteristics, applications, and limitations of the Electron Microprobe X-ray Analyzer (EMXA), the Scanning Electron Microscope (SEM), and the conventional Transmission Electron Microscope (TEM) are outlined. The EMXA is emphasized due to its practical power and versatility. The various modes of operation available, and a normal sequence of steps in the analysis of a completely unknown sample are described. Some advantages and limitations of various microprobe intensity correction procedures, and of computerized correction calculations are given. Examples of microprobe and SEM applications are given. Author

N71-14799*# Barnes Engineering Co., Stamford, Conn.
THE DEVELOPMENT OF A MINIATURE CARBON DIOXIDE SENSOR, PHASE 2 Final Report
Nov. 1970 50 p
(Contract NAS9-7816)
(NASA-CR-114799) Avail: NTIS CSCL 14B

Progress is reported in developing the breadboard miniature carbon dioxide sensor into an engineering model. This model is a back-pack unit and differs from the breadboard unit in that the sensing head and electronics are integrated into one small package, and the sensing head is sealed from the ambient atmosphere. Details of the engineering model are given and the modifications made on the system's critical elements are summarized. The results of the final tests as well as conclusions and recommendations based on the test results are included. Author

N71-14801*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PERFORMANCE OF ATS SPIN-SCAN CLOUDCOVER CAMERA (SSCC) EQUIPMENT AT MOJAVE GROUND STATION, ATS PROJECT
Oct. 1970 74 p refs
(NASA-TM-X-65401; X-460-70-386) Avail: NTIS CSCL 14E

Results are presented of an evaluation of spin-scan cloudcover equipment used for the ATS-1 at the Mojave, California, ground data acquisition station. The equipment investigated included the phase-lock loop, the video subsystem, the photofacsimile subsystem, and the digital recording sub-system. Author

N71-14802*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE NIMBUS 4 MICHELSON INTERFEROMETER
R. A. Hanel, B. Schlachman, D. Rogers, and D. Vanous Dec. 1970 33 p refs
(NASA-TM-X-65395; X-620-70-421) Avail: NTIS CSCL 03B

The design and performance of the Michelson interferometer, IRIS-D, are described, and the design differences which exist between the interferometers flown on Nimbus 3 and 4 are discussed. The performance is demonstrated by examples of spectra obtained while in earth orbit. Author

N71-14807*# TRW Systems Group, Redondo, Calif.
APPLICATIONS OF HOLOGRAPHY TO VIBRATIONS, TRANSIENT RESPONSE, AND WAVE PROPAGATION

D. A. Evensen and R. Aprahamian Washington NASA Dec. 1970 147 p refs
(Contract NAS1-8361)
(NASA-CR-1671; AM-70-11) Avail: NTIS CSCL 14E

The application of holographic techniques to three areas of applied mechanics: (1) high-frequency vibrations of beams and plates, (2) transient response studies, and (3) studies of transverse wave propagation is discussed. Time-average holography was used to record over 30 vibration modes of a cantilever beam, and stored-beam (real-time) interferometry was used to identify over 100 modes of an 8 inch × 10 inch simply-supported plate. The resonant frequencies involved ranged from 9 cps to 100,000 cps. Experimental and theoretical results for mode shapes and resonant frequencies are given for both the beam and the plate. The transient response of a 20 inch cantilever beam was determined using the technique stored-beam (real-time) holographic interferometry combined with high-speed motion picture photography. The resulting displacement-time histories are compared with analytical results for the response problem. The transverse wave propagation study was conducted using pulsed laser holography. Interferograms were obtained of a bending wave propagating in a long beam. Experimental plots of the bending displacement vs. distance along the beam were obtained, and these data were compared with analytical results for the problem. Author

N71-14812# Maryland Univ., College Park. Dept. of Physics and Astronomy.
AN OPTICAL INTERFEROMETRIC METHOD TO ELIMINATE THE ATMOSPHERIC DEGRADATION OF RESOLUTION Final Scientific Report
Douglas G. Currie 15 Sep. 1970 8 p
(Grant AF-AFOSR-1729-69)
(AD-712717; AFOSR-70-2419TR) Avail: NTIS CSCL 20/6

The objective of the research was the development, fabrication and use of an interferometer capable of making high special resolution measurements through the turbulent atmosphere. In particular, a prototype of the interferometer was designed and fabricated, and then tested, both in the laboratory and on a telescope. The knowledge gained from the prototype (a coude model) permitted the design of the final interferometer. This interferometer (a Cassegrain model) is now being fabricated. This paper is an enlargement and explanation of the results presented in the Woods Hole paper. Author (TAB)

N71-14813# Research Triangle Inst., Durham, N.C.
CHEMILUMINESCENT OZONE METER (DRAWINGS)
1970 62 p
(PB-194118; RTI-EU-414) Avail: NTIS CSCL 14B

A complete set of drawings is given for the non-standard components such as the detector assembly of the chemiluminescent ozone meter. USGRDR

N71-14831*# Becton, Dickinson and Co., Raleigh, N.C. Research Center.
TESTING AND FABRICATION OF PLASTIC VACUUM PROBE SURFACE SAMPLERS Final Report, 30 Jun. 1969 – 10 Jul. 1970
10 Jul. 1970 39 p refs
(Contract NAS1-9398)
(NASA-CR-111798) Avail: NTIS CSCL 14B

The design of the described equipment provides an economical sampler for determining the microbial population of surfaces. The unit is lightweight, less expensive than the metal fabricated items, and a sampler that utilizes a sterilized disposable cone assembly. Microbiological tests demonstrate that the performance of the molded plastic vacuum probe is equivalent to that of other similar devices for removal of normally occurring floor contamination. Author

N71-14836# Illinois Univ., Urbana.
MEASUREMENTS OF EFFICIENCY AND TIME RESOLUTION OF MULTIWIRE PROPORTIONAL COUNTERS
L. J. Koestar, Jr., U. Koetz, and S. Segler Dec. 1969 19 p refs Sponsored by AEC
(COO-1195-176) Avail: NTIS

Efficiency measurements of multiwire gas proportional counters in a 1 GeV/c particle beam are described. Results are presented as a function of the location of the particle traversal relative to the wires. Timing spectra relative to coincident scintillation counters show that 99.5% efficiency can be achieved throughout the sensitive area with a full width time resolution of 60 ns. Counter construction is outlined, and a new integrated circuit amplifier-discriminator is presented. Author (NSA)

N71-14837# Atomics International, Canoga Park, Calif. Liquid Metal Engineering Center.
CHARACTERISTICS OF LMEC ELECTRICAL RESISTANCE STRAIN GAGES UTILIZING ARMOUR D ALLOY
M. M. Lemcoe 30 Jun. 1970 107 p
(Contract AT(04-3)-700)
(LMEC-70-6) Avail: NTIS

Results of a development and evaluation study are presented for several high-temperature strain gage configurations which use Armour D alloy (Fe-70/Cr-20/Al-10) as the primary element, and platinum as a temperature-compensating element in the composite gage configurations for use in the LMFBR program. The Armour D gage concepts appear promising for applications up to 1200 F; particularly when used on austenitic stainless-steel components. Author (NSA)

N71-14838# Illinois Univ., Urbana. Dept. of Physics.
THE DOLLY FILM MEASURING SYSTEM
R. W. Downing, R. M. Brown, V. J. Simaitis, J. J. Wray, and D. R. Zander Jun. 1970 3 p Presented at the Intern. Conf. on Instrumentation for High Energy Phys., Dubna, USSR Sponsored by AEC
(COO-1195-192; CONF-700902-1) Avail: NTIS

Dolly, a precision film measuring machine for bubble chamber and spark chamber film, is briefly described. Film transport and optics, operator controls, CRT scanner, and data processing are discussed. NSA

N71-14842 Texas Univ., Austin.
ANALYTIC AEROTRIANGULATION FOR LARGE SCALE PHOTOGRAPHY
David Raleigh Knowles (Ph.D. Thesis) 1969 91 p
Avail: Univ. Microfilms: HC $4.80/Microfilm $3.00 Order No. 69-21841

An analytic aerotriangulation procedure designed specifically for large scale photography is developed, a FORTRAN 4 computer program is written for the IBM system, and the computer program is tested. The results of the testing show that the programmed procedure is exact to within limits that are negligible in their effect on the resulting errors obtained from using actual photographic data. These errors can be attributed to the photography, measurement of photograph coordinates, and ground control, and efforts to improve the results can be concentrated in these areas. Dissert. Abstr.

N71-14843*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMAL ELECTROMOTIVE FORCE CHANGE FOR SOME NOBLE AND REFRACTORY-METAL THERMOCOUPLES AT 1600 K IN VACUUM, AIR, AND ARGON
George E. Glawe Washington Dec. 1970 35 p refs
(NASA-TN-D-7027; E-5787) Avail: NTIS CSCL 14B

Thermal electromotive force changes for 30 thermocouples using

alumina insulators were determined in air, argon, and vacuum, at 1600 K for exposures up to 10,000 hours. Wire sizes ranged from 0.3 to 1.1 mm diameter with 0.5 mm being the most common size. An 87Pt13Rh/Pt pair exposed to air had a −5 K drift. In argon this and the 95W5Re/74W26Re thermocouple both drifted approximately −20 K. Most noble metal thermocouples failed in a vacuum after a few thousand hours of use, while the refractory metal thermocouples did not. Chemical and structural changes in the wires were determined by means of solids mass spectrometry, photomicrography, and hardness testing. Author

N71-14850# Comitato Nazionale per l'Energia Nucleare, Rome (Italy).
INTERFACE FOR PDP-8L COMPUTER CONTROL OF A TRIPLE-AXIS NEUTRON SPECTROMETER [L'INTERFACCIA PER UNO SPETTROMETRO A TRIPLO ASSE PER NEUTRONI CONTROLLATO ON-LINE DA PDP-8L]
L. Babilon, E. de Agostino, and G. Fillarini 22 Dec. 1969 26 p refs In ITALIAN
(RT/EL-(70)1) Avail: AEC Depository Libraries

The interface for a PDP-8L computer control of a triple axis neutron spectrometer is described. Author (NSA)

N71-14871# Grumman Aerospace Corp., Bethpage, N.Y.
ON THE THEORY OF THE PHOTOGRAPHY OF SINGLE AND MULTIPLE COLORS BY THE INTERFERENCE METHOD
M. G. Lippman Nov. 1970 17 p ref Transl. into ENGLISH from J. Phys. (Paris), v. 3, 1894 17 p
(TR-59) Avail: NTIS

Investigations on color photography, carried out before the turn of the century, represent the first successful attempt to reproduce colors accurately in a photographic process. As against the modern practical, but less perfect approach, an actual color preservation in the photographic emulsion, was created by the production of stationary waves represented by alternating dark and light layers within and parallel to the emulsion. Author

N71-14886*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DUAL-CHANNEL SPECTROMETER FOR ROTATIONAL-TEMPERATURE MEASUREMENTS
Carl R. Hookstra, Jr., John C. Hoppe, and William W. Hunter, Jr. Washington Dec. 1970 14 p refs
(NASA-TM-X-2135; L-6859) Avail: NTIS CSCL 14B

A unique dual-channel spectrometer capable of making rotational-temperature measurement of low-density nitrogen gas up to 550 K has been developed and tested. The instrument images on a single variable width entrance slit the fluorescence of the first negative system of nitrogen resulting from inelastic collisions between fast electrons and nitrogen molecules. The rotational energy interval observed by each channel is set by preselected exit slit widths. The ratio of rotational energy within the two channels is then a calculable function of temperature. To understand quantitatively the effect of entrance slit width on the energy ratio between the two channels, a model spectrum of the N2(+)(0-0) and N2(+)(1-1) vibrational bands of nitrogen was calculated. By integration of the model spectrum over the limits set by the exit slits, it was possible to calculate a series of energy ratios for different temperatures at various entrance slit widths. The calculated effect of the entrance slit width on temperature measurements was in good quantitative agreement with the laboratory results. Author

N71-14887# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
GAMMA ABSORPTIOMETER FOR IN LINE MEASUREMENTS OF HEAVY ELEMENT CONCENTRATION IN SOLUTION USING A SCINTILLATION DETECTOR AND A PHOTOMULTIPLIER [ETUDE D'UN TENEURMETRE D'ELEMENTS LOURDS UTILISANT UNE SOURCE DE RAYONNEMENT GAMMA ET UN SCINTILLEUR]
Jean-Claude Edeline and Pierre Quemere Apr. 1970 37 p refs In FRENCH
(CEA-N-1287) Avail: AEC Depository Libraries

A study was made of the characteristics of a current controlled scintillator to be used as a logarithmic response detector for a gamma absorptiometer; this apparatus can carry out in line measurements of heavy element concentrations in solution. The following factors were studied: gain changes in the NaI(Tl)−PM device as a function of the HT, the gamma flux and the temperature; the longlife components of the phosphorescence of the scintillator; the variations in the HT as a function of the flux at constant anode current. In conclusion, the possibility was considered of building an apparatus having an output signal proportional to the heavy element concentrations of the solution; this could be realized by using a plastic scintillator containing 10% lead. NSA

N71-14888# Atomic Energy of Canada, Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
PERFORMANCE OF A MULTI-PURPOSE INSTALLATION OF COMPUTER OPERATED MASS SPECTROMETERS
D. Bell and R. B. Stewart Apr. 1970 12 p refs
(AECL-3470) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River: $0.50

A small on-line computer has been set up both to control the operation and process the data from two analytical mass spectrometers. It has been programmed to handle the varied requirements of a low resolution gas instrument and the isotopic measurements for a thermal ionization solids instrument. Comparisons are given of results from the computer system to those obtained manually from a recording potentiometer. Other data on standard samples are included. Author (NSA)

N71-14893# Army Engineer Topographic Labs., Fort Belvoir, Va.
APPLICATION OF SENSING ARRAYS TO PHOTOGRAMMETRY AND METROLOGY
Desmond C. O'Connor and Pi-Fuay Chen [1970] 14 p refs
(AD-713568) Avail: NTIS CSCL 8/2

The performance and function of the human eye are reviewed. A sensing array system devised by using the concept of the involuntary human eye motion is considered. The systems receptor-array is reduced to a moderate size by the introduction of the perturbation effect, thus decreasing the systems complexity and cost, while retaining equivalent or better system resolutions. Also, the serious lead problem of the receptor-array and the complicated, huge, mechanical scanning device are eliminated. Applications of the array systems to metrology and photogrammetry are discussed. A one-dimensional experimental sensing array is built and tested. The experimental results show that the system can detect the relative position of an object-image of accuracy better than 0.001 in. Suggestions are made to the extension of the idea in the future. Author (TAB)

N71-14894# Harry Diamond Labs., Washington, D.C.
A FLUERIC OSCILLATOR FOR MILITARY TIMER APPLICATIONS
Carl J. Campagnuolo and Stacy E. Gehman [1970] 13 p refs
(AD-713514) Avail: NTIS CSCL 13/7

A flueric RC oscillator that is capable of operating over a wide range of stagnation conditions is described. This oscillator, developed primarily by experimental methods, demonstrates the feasibility of using flueric oscillators as time bases. To optimize pressure and temperature insensitivity, three geometrically similar oscillators with different resistors in the feedback network were constructed and tested. A modification of one of these oscillators had a frequency change of less than plus or minus 1 percent for pressures ranging from 6 to 30 psig and temperatures from −58 to 175F. Author (TAB)

N71-14919# Road Research Lab., Crowthorne (England). Earthworks and Foundations Section.

THE PERFORMANCE OF AN INCLINOMETER FOR MEASURING LATERAL MOVEMENTS IN SOIL

R. T. Murray and M. J. Irwin 1970 33 p

(PB-194035; RRL-LR332) Copyright. Avail: NTIS CSCL 14B

An investigation of the performance of an inclinometer system, developed commercially, for measuring the horizontal movement of earth masses is described. Full-scale laboratory trials were carried out to determine the accuracy of the instrument and the results show that horizontal movements can generally be determined to within seven millimeters over a vertical distance of six meters. The instrument will, therefore, provide a suitable method for determining horizontal movements although it is essential to check the calibration frequently while measurements are being taken. The inclinometer was used for measuring horizontal movement on a road embankment site at Tickton in the East Riding of Yorkshire, where values up to 350 millimeters were recorded. Author (USGRDR)

N71-14927# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.

APPARATUS FOR THE MEASUREMENT AND THE REGULATION OF LOW TEMPERATURES [APPAREIL POUR LA MESURE ET LA REGULATION DES BASSES TEMPERATURES]

Andre Barraud and Roger Gras 25 May 1970 27 p refs In FRENCH

(CEA-N-1366) Avail: AEC Depository Libraries

An apparatus is described for the measurement and stabilization of the temperature of small enclosures, a particular application being that of a variable temperature liquid helium cryostat. This apparatus allows the use of various temperature regulators. Using a graphite resistance regulator, this apparatus permits temperature stabilization between 2 K and 150 K. At 6 K, the stability is 0.001 K. Some special features are: low electric dissipation across the regulator, large gain of the error amplifier, and the inverse parabolic characteristics of the final stage allowing the maximum use of loop gain. Author (NSA)

N71-14940# Joint Publications Research Service, Washington, D.C.

MEASURING TRUE TEMPERATURES VIA POLARIZED RADIATION FLUXES IN VISIBLE RANGE OF THE SPECTRUM

D. Ya Svet et al 20 Nov. 1970 5 p refs Transl. into ENGLISH from Zh. Prikl. Spektroskoppi, Akad. Nauk Belorussk. SSR (Minsk), v. 12, no. 3, 1970 p 518-522

(JPRS-51831) Avail: NTIS

A method for measuring the true temperature by the relative spectral density distribution of polarized radiation is discussed. Considered is the ratio of parallel components of polarized radiation fluxes of different spectral compositions radiated at the same angle. The relations between color temperatures obtained at radiation angles of 0, 60, 70 and 75 degrees by parallel radiation components and the true temperatures within the limits of the Wien approximation are used to obtain true temperatures for tungsten, tantalum, molybdenum and niobium. G.G.

N71-14962# European Organization for Nuclear Research, Geneva (Switzerland). Data Handling Div.

A SYSTEM OF FILM-PLANE DIGITIZERS ON-LINE TO A CDC 3100 COMPUTER

A. Fucci, C. Mazzari, L. Tausch, and C. Verkerk 9 Jul. 1970 24 p refs

(CERN-70-19) Avail: AEC Depository Libraries

The on-line film plane digitizing system used at CERN for measuring bubble chamber film is described. Six measuring devices are connected on-line to a CDC 3100 computer. Both the hardware and software are discussed, and operation and performance are reviewed. NSA

N71-14983# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.

A SCANNING-MEASURING TABLE FOR HANDLING FILMS FROM BUBBLE CHAMBERS AND OSCILLOGRAMS

G. D. Zhilchenkova, G. D. Karlov, V. D. Longinov, M. I. Popov, V. P. Buyanov et al 1969 18 p refs In RUSSIAN

(IFVE-SEF-69-32) Avail: AEC Depository Libraries

A scanning-measuring table with a bipolar coordinate measuring system is described. The work is usually carried out with a 35 mm perforated film. Scanning and measuring is carried out on the screen with a magnification of 20. The least count of each radius is 0.3 mm. Author (NSA)

N71-14988* National Aeronautics and Space Administration. Langley Research Station, Langley Station, Va.

PRESSURIZED CELL MICROMETEOROID DETECTOR Patent

Charles A. Gurtler, inventor (to NASA) Issued 8 Mar. 1966 (Filed 23 May 1963) 5 p Cl. 73-170

(NASA-Case-XLA-00936; US-Patent-3,238,774; US-Patent-Appl-SN-282818) Avail: US Patent Office CSCL 14B

A pressurized cell detector for obtaining direct measurements of the micrometeoroid puncture to thin structural materials used in space vehicles is described. The device is rugged and will withstand severe shock and very high temperatures. It also has a permanent memory, never becomes shorted by the test material when punctured, and does not require continuous monitoring by the telemeter since the signal from the detector consists of a switch opening. In addition its signals to the telemeter will not be affected by environmental temperature changes. Specifications accompany illustrated drawings. E.M.C.

N71-15408*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AN ULTRA-HIGH-SPEED PHOTOGRAPHIC SYSTEM FOR INVESTIGATING HYPERVELOCITY IMPACT PHENOMENA

Philip C. Kassel, Jr. and John D. Di Battista Washington Jan. 1971 14 p refs

(NASA-TN-D-6128; L-7464) Avail: NTIS CSCL 14E

A system has been developed to make detailed photographic studies of hypervelocity projectile impacts into targets on a nanosecond time scale. The system, designed to be used at positions very close to the muzzle of a light gas gun, determines the projectile velocity and subsequently synchronizes a six frame image converter camera which photographs the projectile in free flight and during the impact process. The method utilizes a synchronization technique consisting of a laser powered velocity measuring system, a controlled duration light source, and an automatic time delay that computes the projectile velocity and automatically initiates the photographic process just before impact. The system has been successfully used to photograph 0.56 cm diameter polycarbonate cylinders impacting thin and thick aluminum targets and a thick plexiglass target. Author

N71-15409*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

PHOTOGRAMMETRIC TECHNIQUES APPLICABLE TO EARTH RESOURCES ANALYSES

Paul A. Larsen 21 Aug. 1970 65 p refs

(NASA-TM-X-64548) Avail: NTIS CSCL 08B

The uses of photogrammetry as a tool for studying our natural resources and as an aid in understanding and defining environmental problems confronting the inhabitants of earth are discussed. Numerous applications of photogrammetry from the past are cited, and several very recent applications are discussed briefly,

the intent being to help researchers and engineers in related fields see photogrammetry as an aid in their endeavors. Actual measurements of physical features of the earth's and moon's surfaces, which were made photogrammetrically on stereograms prepared from Apollo 6 and Apollo 8 vertical orbital photographs, are shown. The Skylab Experiment S-190, Six Camera Multispectral Photography, is discussed, and a graphical analysis dealing with the percentage of ground observable by the Skylab cameras as a function of cumulus cloud coverage is presented. The science of photogrammetry has proved to be an exceedingly useful and practical tool in the past, and all indications are that its applicability to life's current and future problems and tasks is just being discovered. Author

N71-15410*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

GENERAL RELATIVISTIC PRECESSION OF A GYROSCOPE IN AN INCLINED ORBIT

Peter Eby 16 Jul. 1970 24 p refs

(NASA-TM-X-64535) Avail: NTIS CSCL 14B

The general relativistic precession of a gyroscope in an inclined orbit is calculated. The magnitude of the precession is found to be proportional to the cosine of the inclination angle, apart from periodic terms. It is shown that the geodetic precession cannot be separated from the motional precession no matter what initial orientation is chosen for the gyroscope. Author

N71-15411*# LTV Research Center, Dallas, Tex.

FLIGHT PROTOTYPE ELECTROSTATIC BALLISTIC PENDULUM Final Report

John G. Powell Oct. 1968 163 p ref

(Contract NAS9-7290; LTVR Proj. 08460)

(NASA-CR-114785) Avail: NTIS CSCL 01D

A transducer package has been developed which has a total weight of 20 grams with an impact surface approximately 5 cm × 5 cm, detects momentum over the design range with the desired signal to noise ratio, and operates over the required temperature range with no spurious outputs due to thermal expansion. In addition, the components, structure, materials, and manufacture of these flight prototype EBP's are such as to demonstrate that subsequent flight EBP's fabricated from the drawings and specifications will pass the ALSEP flight qualification tests when mounted in the lunar meteoroid detector. Author

N71-15412# Joint Publications Research Service, Washington, D.C.

CONSTRUCTION OF THE SIX-METER TELESCOPE

B. K. Ioannisiani 17 Dec. 1970 7 p Transl. into ENGLISH from Novaya Tekhn. Astron. (Leningrad), no. 3, 1970 p 5–9

(JPRS-52015) Avail: NTIS

Progress is reported on the design and construction of a six-meter telescope. Development includes the following: The telescope and horizontal axis are fully assembled and tested. All control system instruments are fabricated. These include a central control panel, two identical special electronic digital control units (operating and stand-by), with their control panels and various kinds of amplifying, relay-commutation, and other instrumentation. The casting and fine annealing of the main mirror block are completed. Two lathes were created for finalizing the main mirror: a reconstructed turning lathe for preliminary working of the glass casting and a special grinding and polishing lathe for processing the mirror. The problem of transporting the telescope units and components to the site of their installation has also been solved. E.M.C.

N71-15415# Argonne National Lab., Ill.

SELECTED DATA AND DISCUSSION OF THE PLUGGING INDICATOR FOR SODIUM LOOPS

P. Vilinskas, E. C. Filewicz, and J. R. Humphreys Jun. 1970 16 p refs

(Contract W-31-109-eng-38)

(ANL-7658) Avail: NTIS

The initial results showed that temperatures of manual plugging indicators did not agree with cold-trap temperatures as required by theory. Manual plugging runs were made to determine reasons for the large variation in temperature difference. The cooling rates were varied while maintaining constant plugging-indicator flow rate and cold-trap temperature. These results indicated the trend that at low cooling rates (approaching zero) the plugging temperature would approach cold-trap temperature. Results of work with the oscillating plugging indicator indicated the reasons for the large variation observed with the manual plugging indicators. The manual plugging indicator used in the tests was modified into an oscillating plugging indicator, and successful runs were made in the temperature range of 269 to 400 F. Temperature changes of the cold trap, and hence the impurity concentration of the sodium in the system, were indicated on the temperature trace of the oscillating plugging indicator. Author (NSA)

N71-15416# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

EVALUATION OF Ge(Li) COMPTON SUPPRESSION SPECTROMETERS FOR NONDESTRUCTIVE RADIOCHEMICAL ANALYSIS

J. A. Cooper Aug. 1970 19 p refs

(Contract AT(45-1)-1830)

(BNWL-1285) Avail: NTIS

Ge(Li) Compton suppression spectrometers are evaluated relative to the specific needs of the analytical radiochemist. Their application to the analysis of radionuclides found in neutron activation, fission product, and environmental radionuclide analyses is discussed. Author (NSA)

N71-15419# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.

DEVICE FOR SIMULTANEOUS MEASUREMENTS OF LENGTH AND RESISTIVITY UNDER IRRADIATION AT LOW TEMPERATURE

Claude Weinberg, Rolland Rene Conte, and Jacques Dural Jun. 1970 34 p refs In FRENCH

(CEA-N-1315) Avail: AEC Depository Libraries

By using a linear differential variable transformer (L.D.V.T.) in an in-pile irradiation capsule, it is possible to measure length variations in the flux. The operating conditions and the calibration of the transformer are described. The maximum length change measurable is 2 plus or minus 1 millimeter; the sensitivity is 0.1 micron. Resistivity changes are simultaneously measured to an accuracy of 2 times .0001 with respect to the length. The capsule allows either in-flux measurements or annealing from 4 to 400 K after being irradiated. Some results obtained with uranium wires are presented as examples. Author (NSA)

N71-15421# Atomics International, Canoga Park, Calif.

LMFBR TASK 25, TRANSIT TIME FLOWMETER Annual Technical Progress Report, GFY 1970

15 Aug. 1970 14 p refs

(Contract AT(04-3)-701)

(AI-AEC-12973) Avail: NTIS

The development of a flowmeter using noise-analysis techniques which will be suitable for use as a flow-measurement standard in large liquid-metal systems at temperatures to 1200 F or higher is described. Also, the development and testing of a small flowmeter for use in measuring flowrate from individual fuel assemblies in liquid-metal-cooled reactors such as the FFTF is reported. Operation of the transit time flowmeter depends upon the

detection of small temperature variations (thermal eddies) at two points a known distance apart in a flowstream. The two signals are cross-correlated with a variable delay time. The delay time which gives maximum correlation is the transit time of the fluid between the sensors, which time is inversely proportional to the fluid velocity. NSA

N71-15436*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

INTRINSIC EFFICIENCIES OF SPHERICAL NaI(Tl) DETECTORS

J. I. Trombka Oct. 1970 19 p refs Submitted for publication
(NASA-TM-X-65393) Avail: NTIS CSCL 03B

The intrinsic efficiencies of spherical NaI(Tl) detectors are considered with respect to the efficiencies of cylindrical NaI(Tl) detectors. A simple method of calculating the intrinsic efficiencies of spherical detectors is presented. It is shown that the problems introduced by the dependence of detection efficiency on the angular distribution of the incident gamma-ray flux for cylindrical detectors can either be eliminated or greatly reduced by the use of spherical detectors. Author

N71-15450# Comitato Nazionale per l'Energia Nucleare, Rome (Italy).

SOFTWARE FOR PDP-8L ON-LINE CONTROLLED TRIPLE-AXIS SPECTROMETER [IL SOFTWARE PER UNO SPETTROMETRO A TRIPLO ASSE PER NEUTRONI CONTROLLATO ON-LINE DA UN PDP-8L]

L. Babiloni, E. De Agostino, and G. Fillarini 17 Feb. 1970 36 p refs In ITALIAN
(RT/EL-(70)2) Avail: AEC Depository Libraries

The software for a PDP8-L controlled triple axis diffractometer is described. A detail description is given of the programs for the data acquisition and the on-line control. Author (NSA)

N71-15454# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.

PROTECTION OF PULSE MEASURING EQUIPMENT AGAINST SPURIOUS NOISES

J. Buisson and J. Garau Jun. 1970 14 p In FRENCH
(CEA-N-1353) Avail: AEC Depository Libraries

The correct functioning of neutron pulse measuring equipment in noisy environments is very dependent upon the technology of the connecting materials and the precautions taken in making the connections. The general rules applying to the liaison of the detector and the electronic subassembly are stated. The type of liaison giving the best protection against spurious noises is given. The technology recommended for different parts of this liaison (detectors, connectors cables) is discussed. The types of materials to be used with the pulse measuring subassemblies of the standard Multibloc type are reviewed. NSA

N71-15470# Joint Publications Research Service, Washington, D.C.

CONTEMPORARY INSTRUMENT TECHNOLOGY

P. I. Bulovskiy et al 1 Dec. 1970 19 p refs Transl. into ENGLISH from Imeko V. (USSR), no. 25–30, May 1970 p 91–115
(JPRS-51883) Avail: NTIS

A brief characterization of the state of instrument building technology is given. Certain problems of instrument building technology and the primary directions of its development are reviewed. It is demonstrated that questions of the development of instrument building technology are linked with working out the technological bases of designing, introduction of new principles of drafting technology and progressive technological processes, and with solving a number of organizational-economic problems. Author

N71-15471# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.

THE PULSED WIRE ANEMOMETER: AN ANALYSIS TO DETERMINE THE ERRORS CAUSED BY THE PROBE'S FINITE YAW RESPONSE

I. P. Castro Nov. 1970 14 p refs
(Rept-70-07) Avail: NTIS

The pulsed wire anemometer has a finite yaw response and an analysis is presented for the determination of the errors arising from this restricted response in the measurement of both the mean velocity and the turbulent intensity. It is found that these errors are quite small in the more usual practical applications of the instrument. Author

N71-15472# California Univ., Livermore. Lawrence Radiation Lab.

METHOD FOR EVALUATION AND CERTIFICATION OF THE SIP TRIOPTIC UNIVERSAL MEASURING MACHINE

Donald L. Lane 21 Apr. 1970 40 p Sponsored by AEC
(UCRL-50879) Avail: NTIS

Results of 30 evaluation and certification tests for the SIP trioptic universal measuring machine are discussed. Photographs of each test setup are included. Author (NSA)

N71-15473# Los Alamos Scientific Lab., N.Mex.

DESIGN AND FABRICATION OF A THERMAL SCANNER

Karl L. Meier Apr. 1970 9 p refs
(Contract W-7405-eng-36)
(LA-4453-MS) Avail: NTIS

The thermal scanner is an experimental device used to determine the size and movement of fission product gas bubbles in the bond of a Na-bonded reactor fuel pin. A reactor fuel pin is simulated by a heater, a UC cylinder, and a 10-mil Na bond, all contained in a 10-mil wall, 0.350-in. o.d. stainless steel cylinder that simulates the fuel pin cladding. A He or Ar gas bubble is created in the bond by a micrometer syringe. Thermocouples are used to measure the cladding temperature. Bubbles in the bond cause the cladding temperature to depart from normal. The thermocouple output is interpreted by a computer that produces a temperature map of the cladding surface. Movement of the bubble is determined from successive maps. Author (NSA)

N71-15476# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.

SPECTRORADIOMETRY AND CONVENTIONAL PHOTOMETRY: AN INTERLABORATORY COMPARISON

D. A. Mc Sparron, K. Mohan, R. C. Raybold, R. D. Saunders, and E. F. Zalewski Nov. 1970 196 p refs
(NBS-TN-559) Avail: SOD $1.50

The results of a fluorescent lamp inter-comparison to evaluate the interlaboratory precision obtainable in photometric and spectroradiometric measurements are summarized. The tests were also designed to disclose suspected systematic errors in measurement techniques. The intercomparison consisted of five parts: (1) a homochromatic, photometric measurement of cool white fluorescent lamps and a heterochromatic, photometric measurement of a daylight fluorescent lamp and an incandescent lamp utilizing cool white fluorescent lamps as standards, all within an integrating sphere; (2) spectro-radiometric measurement of the above lamps in an integrating sphere; (3) spectroradiometric measurement of a 25 cm section of the fluorescent lamps in a baffled enclosure; (4) an experiment designed to reveal systematic errors in heterochromatic photometry; and (5) measurement of the x and y chromaticity coordinates with a Barnes colorimeter. Author

N71-15477# Central Technical Inst., TNO, Delft (Netherlands).

DYNAMIC RESPONSE OF THERMISTORS AT LH TEMPERATURE

J. A. Knobbout Sep. 1969 7 p
(Rept-69-03400) Avail: NTIS

The dynamic response was measured in an apparatus for static calibration of thermistors. The tests show that the thermistors do not behave as a first order but as a second or higher order system, the observed response can be approximated by a number of higher order systems, the characteristic time constant of the thermistor at 20 K is higher than that given in the manufacturer's specification, and the time constant at 20 K is not small enough that the dynamic response on the observed temperature can be disregarded. Author

N71-15479# Idaho Nuclear Corp., Idaho Falls.
HIGH TEMPERATURE ULTRASONIC THERMOMETER FOR MEASURING REACTOR FUEL TEMPERATURE
A. E. Arave and R. H. Meservey Aug. 1970 23 p refs
(Contract AT(10-1)-1230)
(IN-1413) Avail: NTIS

An ultrasonic thermometer (UT) is being developed for use in making internal fuel temperature measurements in high temperature reactors. Of primary interest are the fuel temperatures in the loss-of-fluid tests (LOFT) and in the power burst facility (PBF). Both reactors will produce peak fuel temperatures of about 2450 C. The LOFT application is a steady state measurement, while the PBF requires response times in order of tenths of a second. The UT is a refractory wire in which the ultrasonic wave propagation time is a function of temperature. The refractory metal sensor is selected to meet the environmental and accuracy requirements of the measurement. The UT has been tested out-of-pile at temperatures up to 2600 C, and in in-pile transient tests at temperatures up to 1800 C. The accuracy of the UT is + or − 25 C, which is about + or − 1% at the highest temperatures expected. Author (NSA)

N71-15480# Army Foreign Science and Technology Center, Washington, D.C.
A THERMOANEMOMETER FOR MEASURING THE TEMPERATURE, VELOCITY, AND DIRECTION OF A GAS STREAM
Yu. V. Karbe et al 14 Jan. 1970 9 p Transl. into ENGLISH from Prib. Sist. Upr. (USSR), No. 11 p 43−44
(AD-713664; FSTC-HT-23-254-70) Avail: NTIS CSCL 14/2

A portable thermoanemometer of the EA-2 type, the sensing element of which consists of two semiconducting thermoresistors, type MMT-6 arranged in parallel with a fixed distance between axes, was developed for remote measurements of temperature, velocity and direction of a gas stream which is convenient for use under laboratory and factory conditions. Author (TAB)

N71-15483*# Perkin-Elmer Corp., Norwalk, Conn. Optical Group.
THEORETICAL EFFICIENCY OF THE PRINCETON TWO-ELEMENT ECHELLE SPECTROGRAPH
D. A. Markle, Alan B. Wissinger, and H. S. Hemstreet Sep. 1969 51 p refs Prepared for Princeton Univ. Obs.
(Grant NGR-31-001-044)
(NASA-CR-115892; ER-9746) Avail: NTIS CSCL 14B

One of the building blocks of the spaceborne stellar telescope which evolved in the Advanced Princeton Satellite Study was the very compact echelle spectrograph. The echelle arrangement produces a spectrum folded like the lines of type on a printed page and allows a large wavelength increment to be integrated and read out on an image tube in about the same time as might be required for a single wavelength with a conventional scanning monochromator. Since the spectrograph was intended to study the 1000A to 3000A spectral region, refractive components could not be used and the number of reflections had to be minimized since losses as high as 50% per surface are common at the shorter wavelengths. The 30 inch long, two element echelle employing a spherical predisperser grating operating in first order and a flat echelle grating operating in the 14th through to the 39th orders is discussed in detail. A.L.

N71-15510# Stanford Linear Accelerator Center, Calif.
AN ON LINE VIDICON SCANNING SYSTEM FOR RAPID CYCLE BUBBLE CHAMBERS
R. G. Friday, D. W. G. S. Leith, and D. G. McShurley Jun. 1970 4 p Presented at the Intern. Conf. on Instrumentation for High Energy Phys., Dubna, USSR, 8−12 Sep. 1970 Sponsored in part by AEC
(SLAC-PUB-792; CONF-700902-3) Avail: NTIS

A prototype vidicon scanning system, built to determine the feasibility of using integrated circuits in conjunction with video and computer equipment to scan and digitize bubble chamber pictures in real time, is briefly described and preliminary tests are outlined. NSA

N71-15511# California Univ., Livermore. Lawrence Radiation Lab.
NEW HIGH-TEMPERATURE AND PRESSURE TENSILE TESTER
M. Onami and K. Motole 1969 8 p refs Presented at the 11th Symp. on High Pressure, Sendai, Japan, 24−26 Oct. 1969 Transl. into ENGLISH from Japanese Paper Sponsored in part by AEC
(UCRL-Trans-10472; CONF-691048-1) Avail: NTIS

The design of a tensile tester is described and illustrated. The equipment is designed so that only the specimen is exposed to the pressure field. The error in load measurement is as low as 0.2% for the entire load range. Various types of constant strain rate tests and constant load tests are possible. Specimen temperature can be controlled. Results of stress testing an Al cylinder are included. NSA

N71-15519# California Univ., Livermore. Lawrence Radiation Lab.
AN AUTOMATED, HIGH-SENSITIVITY, THREE-COLUMN GAS CHROMATOGRAPH
Jack W. Frazer, Virgil Du Val, and Roger E. Anderson 21 Apr. 1970 15 p refs Sponsored by AEC
(UCRL-50849) Avail: NTIS

An automated three-column gas chromatograph is described. Included are data comparing the relative merits of three different methods of data acquisition. Author

N71-15552# Comissao Nacional de Atividades Espaciais, Sao Jose Dos Campos (Brazil).
REMOTE SENSING OF FERRIFEROUS AREAS
Jul. 1970 135 p refs In PORTUGUESE
(LAFE-126) Avail: NTIS

The project to survey the natural resources of Brazil by remote sensors is described. The remote sensing techniques, objectives, and the economic aspects of the program are presented. Data interpretation techniques are also reviewed. Transl. by F.O.S.

N71-15559# California Univ., Livermore. Lawrence Radiation Lab.
INSTRUMENTATION FOR MONITORING OF Kr 85 AND H 3 IN NATURAL GAS
C. T. Prevo and V. C. Santomassimo 26 May 1970 11 p Sponsored by AEC
(UCRL-50882; PNE-G-64) Avail: NTIS

A system using CaF2(Eu) crystals to monitor natural gas from nuclearly stimulated gas wells for H-3 and Kr-85 is described.

Online monitoring is provided with sensitivities of 1.3 × 10 to the minus 7th power microcurie/cu cm in 20 min for Kr-85 and 2 × 10 to the minus 5th power microcurie/cu cm in 20 min for H-3.
Author (NSA)

N71-15561*# Beckman Instruments, Inc., Fullerton, Calif.
DESIGN MODIFICATIONS TO A MARS ATMOSPHERIC WATER DETECTION SPECTROPHOTOMETER Final Report
B. D. Henderson Nov. 1970 126 p refs Prepared for JPL
(Contracts NAS7-100; JPL-952871)
(NASA-CR-115891; FR-2616-101) Avail: NTIS CSCL 14B

An optical design study is described aimed at accomplishing certain modifications to the spectrophotometer planned for the Viking Orbiter spacecraft. The modifications consist of: (1) increasing the frequency range more than two-fold; (2) changing the prismatic corner reflector of the early design to two corner mirrors; (3) changing the quartz singlet lens to a reflecting telescope; (4) adding a scanning mirror; (5) adding an optical system which projects neon wavelength calibration sources into the monochromator; and (6) adding an optical system which projects an intensity calibration source into the monochromator. The material presented contains most of the significant engineering information obtained from computer ray-trace studies used in the design accomplishment.
D.L.G.

N71-15577# Aeronautical Research Labs., Melbourne (Australia).
ADDRESS INDICATOR FOR A PRESSURE SCANNER
H. Mokotow Apr. 1970 27 p refs
(ARL/ME-314) Avail: NTIS

A numeric display provided by an address indicator was designed to identify the port of a forty-eight channel pressure scanner. This display is part of the data logging equipment used with the supersonic intake rigs.
Author

N71-15580# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
VISION WITH THE SMALL STARLIGHT SCOPE, A THREE STAGE IMAGE INTENSIFIER
A. van Meeteren, J. J. Vos, and J. Boogaard [1970] 31 p refs
(IZF-1970-11) Avail: NTIS

Spatial modulation sensitivity functions of vision with the small starlight scope, as a representative three stage image intensifier, were measured with luminance as a parameter. Modulation sensitivity functions are comparable to normal modulation transfer functions, commonly used to describe image forming systems. They differ from them in that they also involve the detection threshold. The purpose of the measurements is first to determine the actual performance of the small starlight scope and second to test its theoretical evaluation. Vision with the small starlight scope proves to follow the physical limit, put by the statistical fluctuations in the number of photons detected by the photocathode and so is comparable to unaided vision. On this basis it is possible to predict the effective luminance gain provided by the instrument. It remains questionable whether the eye's spatial processing of the visible noise on the phosphor screen of an image intensifier is also comparable to unaided vision. Surprisingly the blurring by the intensifier tube seems to contribute to spatial integration of noise and thus to improve modulation sensitivity.
Author

N71-15581# Specola Vaticana (Vatican City).
VATICAN OBSERVATORY Annual Report, 1969
1969 10 p refs
Avail: NTIS

A series of reports in astronomical research are reported. Information includes electronics, spectroscopic analysis, and construction and modification of instruments.
E.H.W.

N71-15598* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DIFFERENTIAL TEMPERATURE TRANSDUCER Patent
David Wald, inventor (to NASA) Issued 8 Mar. 1966 (Filed 30 Jan. 1963) 6 p Cl. 73-341
(NASA-Case-XAC-00812; US-Patent-3,238,777; US-Patent-Appl-Sn-255132) Avail: US Patent Office CSCL 14B

Described is an improved differential thermopile that is particularly adapted to the measurement of cooling water temperature rise in electric arc heaters wherein strong electric and magnetic fields, stray currents within cooling water, and high coolant pressures are experienced. The accurate measurement of the temperature rise of the cooling water flow is often required for the control of such an apparatus.
Official Gazette of the U.S. Patent Office

N71-15599* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PHOTOELECTRIC ENERGY SPECTROMETER Patent
Randolph A. Becker, inventor (to NASA) Issued 13 May 1969 (Filed 27 Jul. 1966) 5 p Cl. 250-83.3; Int. Cl. G01t1/16; Int. Cl. H01j39/14 Sponsored by NASA
(NASA-Case-XNP-04161; US-Patent-3,444,378; US-Patent-Appl-SN-568356) Avail: US Patent Office CSCL 14B

Described is a spectrometer that uses photoelectrons released from a photocathode to yield continuous spectral data. The photocathode emits electrons in response to the impingement of photons at a velocity determined by the frequency of the impinging radiation. The electrons pass through a deflecting means. A discriminator comprising plate having an off axis aperture permits the deflected electrons to pass through to a collecting target.
G.G.

N71-15600* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
APPARATUS FOR TENSILE TESTING Patent
Elvis D. Wallace, inventor (to NASA) Issued 3 Feb. 1970 (Filed 21 Jun. 1967) 5 p Cl. 73-97; Int. Cl. G01n3/28
(NASA-Case-XKS-8250; US-Patent-3,492,862; US-Patent-Appl-SN-649075) Avail: US Patent Office CSCL 14B

An apparatus for determining the tensile strength of a specimen which has been machined into the form of a piston is described. Pressurized fluid, to which the device constructed from material forming the specimen would be subjected to, is inserted within a cylinder of a load cell between two enlarged ends of the test specimen. The tensile strength of the specimen can be calculated from the increase of pressure until the specimen fails.
Official Gazette of the U.S. Patent Office

N71-15604* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ANTI-GLARE IMPROVEMENT FOR OPTICAL IMAGING SYSTEMS Patent
Edger S. Davis, inventor (to NASA) Issued 6 Jan. 1970 (Filed 19 Mar. 1968) 6 p Cl. 350-58; Int. Cl. G03b11/04; Int. Cl. G02b21/08; Int. Cl. G02l1/30 Sponsored by NASA
(NASA-Case-NPO-10337; US-Patent-3,488,103; US-Patent-Appl-SN-714298) Avail: US Patent Office CSCL 17H

An anti-glare baffle having a specularly reflective surface formed from an oblate hemispheroid is described. A shading flange extends inwardly from the upper edge of the hemispheroid and intersects the foci of the oblate hemispheroid. The oblate hemispheroid and flange surround a viewing aperture and spaced ray detecting device. This light baffle is effective in reducing glare from light sources out of the desired field of view and permits maximum acceptance of the light rays emanating from within the field of view.
Official Gazette of the U.S. Patent Office

N71-15605* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RETRODIRECTIVE MODULATOR Patent
Michael W. Fitzmaurice and Peter O. Minott, inventors (to NASA) Issued 3 Feb. 1970 (Filed 7 Aug. 1967) 5 p Cl. 350-285; Int. Cl. G02f1/34
(NASA-Case-GSC-10062; US-Patent-3,493,294; US-Patent-Appl-SN-658955) Avail: US Patent Office CSCL 20F

The optical modulator and retrodirector comprises a primary, concave spherical mirror and a secondary, convex spherical mirror located approximately at the focal point of the primary mirror. The secondary mirror is moved about the focal point in response to a modulating signal source. Correction of spherical aberration is attained by the inclusion of a spherical correcting lens, concentric with and having the same radius of curvature as the secondary mirror, and with an aspherical correcting lens. The radius of the primary mirror is different from that of the secondary mirror, but all of the spherical elements have a common center of curvature. Official Gazette of the U.S. Patent Office

N71-15620* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXCESSIVE TEMPERATURE WARNING SYSTEM Patent
Ian O. Mac Conochie, inventor (to NASA) Issued 20 Jan. 1970 (Filed 26 Nov. 1968) 6 p Cl. 340-57; Int. Cl. B60q1/00; Int. Cl. G08b1/08 Continuation-in-part of US Patent Appl. SN-550083, Filed 11 May 1966
(NASA-Case-XLA-01926; US-Patent-3,491,335; US-Patent-Appl-SN-784521) Avail: US Patent Office CSCL 13L

A warning system for operators of large aircraft or landing vehicles is described that relays impending danger arising from excessive wheel temperatures by using a temperature sensor to energize a transmitter; the latter in turn emits a signal to a remote receiver for activation of a warning devoice. A coulomb damped bimetallic temperature sensor is used to activate the transmitter, and a bellows heat sensor is used to control the action of the noisemaker device. G.G.

N71-15621* Hughes Aircraft Co., Culver City, Calif.
GUIDANCE AND MANEUVER ANALYZER Patent
John J. Ribarich and Leonard H. Davids, inventors (to NASA) Issued 3 Feb. 1970 (Filed 15 Aug. 1967) 7 p Cl. 35-10.2; Int. Cl. C09b9/02, 19/16 Sponsored by NASA
(NASA-Case-XNP-09572; US-Patent-3,493,665; US-Patent-Appl-SN-660841) Avail: US Patent Patent Office CSCL 17G

A guidance and maneuver analyzer is described that has a transparent spacecraft simulating sphere suspended in an aperture in the center of a plane surface. The surface is inscribed with various coordinate systems. The sphere has apertures along axes corresponding to the spacecraft axes and other locations of instruments. Guidance and maneuvers are simulated by rotating the sphere to correspond to maneuver corrections and by observing its location with respect to bodies assumed to be aligned along selected coordinates. The sphere and surface are suspendable above a base planar surface representing the surface of a body in space so that terminal flight phases may be simulated with respect thereto. Official Gazette of the U.S. Patent Office

N71-15622* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
HIGH TEMPERATURE LENS CONSTRUCTION Patent
Kenneth R. Lorell, inventor (to NASA) Issued 3 Feb. 1970 (Filed 22 Jun. 1966) 5 p Cl. 350-213; Int. Cl. G02b3/00, 7/02 Sponsored by NASA
(NASA-Case-XNP-04111; US-Patent-3,493,291; US-Patent-Appl-SN-560969) Avail: US Patent Office CSCL 20F

Described is a lens assembly for solar furnace or solar simulator entrances. To prevent lens destruction by operational heat, the lens assembly is made up of a multiplicity of identical quartz lens blocks carefully clustered together in a side-by-side, continuous relationship within a common plane to form compact lens units. Relief openings between the ends of adjacent segments contain spherical keys to prevent displacements of individual lens blocks. G.G.

N71-15628# Sandia Corp., Albuquerque, N.Mex.
OPERATION AND MAINTENANCE INSTRUCTIONS WITH ILLUSTRATED PARTS BREAKDOWN, T446 TRITIUM ALARM-MONITOR. INCLUDES T2071 POWER SUPPLY, T464 BATTERY CHARGER, AND T449 RADIOLOGICAL URINALYSIS KIT
15 May 1970 114 p Sponsored in part by AEC, DASA, and Air Force
(SC-M-70-512; AEC-DASA-TP-T468-2; AF-TO-11N-T446-2) Avail: NTIS

The T446 tritium alarm monitor is a small portable air sampler which uses a flowthrough proportional detector for monitoring tritium and other radioactive gases. The T446 has range capabilities from 5 micro curies per cubic centimeter to 10 curies per cubic centimeter and an adjustable alarm level. The principles of operation; inspection and maintenance procedures; troubleshooting; calibration; and preparation for use, storage, and shipment are described. NSA

N71-15653# Comissao Nacional de Atividades Espaciais, Sao Tose Dos Campos (Brazil).
REMOTE SENSING PROJECT. PHASE C: AGRICULTURE Final Report
A. G. De Souza Coelho and Hector W. McNeill Sep. 1970 102 p refs
(LAFE-132) Avail: NTIS

Brazilian agricultural remote sensing research projects are described. Subjects discussed are: (1) field measurements, (2) coffee spacing, (3) soils, (4) soil nutrient status, (5) land use capability, (6) yield prediction, (7) primary yield evaluation, (8) tolerance theory, (9) system for crop boundary and natural vegetation, and (10) boundary recognition. Author

N71-15700*# Honeywell, Inc., Lexington, Mass. Radiation Center.
INFRARED PHOTODETECTORS (15.5 MICRON MERCURY CADIUM TELLURIDE PHOTODETECTORS FOR OPERATION AT105 DEG K) Final Report, 11 Aug. 1969–11 Mar. 1970
N. C. Aldrich and B. L. Musicant Nov. 1970 47 p
(Contract NAS5-21068)
(NASA-CR-115899) Avail: NTIS CSCL 09A

The results are presented of a program aimed at the production of infrared photodetectors with a specific detectivity greater than 50,000 km-(sq root Hz)/watt at 15.5 microns, and with a responsive time of less than 50 microseconds. The program was divided into five main parts consisting of: (1) theoretical analysis, (2) growth of a (Hg,Cd)Te ingot, (3) detector fabrication and testing at 78 K, (4) variable temperature testing, and (5) final packaging. Three detectors were fabricated with each meeting or surpassing the design goals. The results establish the feasibility of using high performance (Hg,Cd)Te 15.5 micron detectors at temperatures well in excess of 80 K. Author

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control, and reliability; drafting; and materials fabrication, handling, and inspection.

N71-14785*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LUBRICATION CONSIDERATIONS IN GEAR DESIGN

D. P. Townsend [1970] 35 p refs Presented at Gear Seminar 'Operation Update,' Cleveland, 10 Dec. 1970

(NASA-TM-X-52942) Avail: NTIS CSCL 11H

Mechanical and service variables must be considered to obtain optimum gear performance under severe operating conditions. The lubricant in gearing prevents failure under several regimes of operation, such as boundary lubrication, mixed lubrication, and full elastohydrodynamic (EHD) film operation. Gears operating under boundary and mixed lubrication require added protection by using extreme pressure and antiwear additives to prevent failure. Understanding the mechanism of how these additives work can aid the designer in his selection of a lubricant for a particular application. In many applications gears operate with a full EHD film. The method of EHD film formation and how the lubricant properties affect the film are discussed, and an analytical method for determining EHD film thickness from theory and how the film affects gear failure mode and life are presented. Author

N71-14786*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ANTIWEAR AND EP ADDITIVE EFFECTS DURING ROLLING AND SPINNING CONTACT WITH A SYNTHESIZED HYDROCARBON OIL

Erwin V. Zaretsky [1970] 29 p refs Presented at Conf. on Chem. Effects at Bearing Surfaces, Swansea, Engl., 6-8 Jan. 1971; sponsored by the Inst. of Mech. Engr. Supported in part by the Mobil Res. and Develop. Corp., Paulsboro, N.J.; SKF Ind., Inc., King of Prussia, Pa.; and GE, Cincinnati

(Contracts NASw-492; NAS3-7261)

(NASA-TM-X-52931) Avail: NTIS CSCL 11H

Tests were conducted to determine the effect of antiwear and extreme pressure (EP) additives in a synthesized hydrocarbon oil on bearing spinning torque and endurance. These additives were stearic acid, oleic acid, oleyl phosphate, oleyl phosphite, zinc dithiophosphate, and a substituted organic phosphonate. Under conditions of pure spinning, elastohydrodynamic conditions prevailed without significant surface interaction. The addition of the antiwear and EP additives in concentrations of 0.1, 1.0 and 10 percent did not change the spinning torque over that obtained with the base fluid in the tests with pure spinning and no rolling. The viscoelastic properties of the base fluid were not changed by the additives tested. The substituted organic phosphonate additive proved effective to temperatures of 600 F in preventing gross surface damage with full-scale angular contact ball bearings. Under a low oxygen environment at 600 F, 120-mm bore angular contact ball bearings had a life nearly 14 times AFBMA-predicted (catalog) life with the fluid having the organic phosphonate additive. Author

N71-14787*# Tennessee Univ., Knoxville. Dept. of Mechanical and Aerospace Engineering.

RAREFIED-GAS VISCOSEAL

Harvey J. Wilkerson (Ph.D. Thesis) Aug. 1970 109 p refs

(Grant NGR-43-001-023)

(NASA-CR-115890; AE-70-023-8) Avail: NTIS CSCL 11A

A fundamental study of the rarefield gas viscoseal was initiated to expand the basic understanding of its operation under low density conditions. The efforts consisted of both experimental and analytical investigations. The theoretical analyses were based on formulating rarefied corrections to the laminar continuum equations for viscous flow. Both slip boundary conditions and self-diffusion contributions were applied to the Reynolds lubrication equations. An experimental investigation has been conducted on a multiple grooved two inch diameter viscoseal over a wide range of gas densities and shaft speeds up to 30,000 rpm. Comparisons are presented between actual viscoseal performance and the theoretical predictions for both sealing coefficient and net leakage parameters as functions of the degree of gas rarefication. Comparisons with the experimental data of several other investigators were made. In general the developed theoretical models predict the trends of the experimental data; however, some deviations between the theories and experiment exist. Author

N71-14817*# Mobil Research and Development Corp., Paulsboro, N.J.

MICROFOG LUBRICANT APPLICATION SYSTEM FOR ADVANCED TURBINE ENGINE COMPONENTS, PHASE 1. TASKS 1 AND 2: WETTABILITIES OF MICROFOG STREAMS OF VARIOUS LUBRICANTS AND OPTIMIZATION OF MICROFOG LUBRICATION

J. Shim and S. J. Leonardi 15 May 1970 87 p refs

(Contract NAS3-13207)

(NASA-CR-72743) Avail: NTIS CSCL 11H

Using the techniques and equipment previously developed, wettabilities of microfog streams of five high temperature lubricants on a static metal surface were determined under an inert atmosphere of nitrogen at temperatures ranging from 800 to 800 F. The wetting data are discussed in relation to the rate of oil-mist output, impaction velocity, temperature and surface characteristics of the wetted plate, and properties of the lubricants. Author

N71-14818*# Naval Research Lab., Washington, D.C. Ocean Materials Criteria Branch.

CHARACTERIZATION OF TIG WELDS IN 12-5-3 MARAGING STEEL PLATE WITH APPLICATION OF A NEW SCALING METHOD FOR K SUB Ic PLASTICITY CORRECTIONS

F. R. Stonesifer and H. L. Smith 16 Apr. 1970 28 p refs

(NASA Order W-11763)

(NASA-CR-115887; AD-708004; NRL-7053) Avail: NTIS CSCL 13E

This report is concerned with fabricating and optimizing weld joints in the 12-5-3 maraging steel. Three weld-wire compositions, two TIG welding processes, and two heat-treating sequences were compared in all possible combinations. Welds and weld repairs were compared in tensile, impact, fracture-toughness, and metallographic evaluations. Various comparisons are presented in tables and graphs. These data show that the slightly increased yield strength obtained through the Big TIG welding process is more than offset by the reduced toughness K sub Ic values, obtained from the three-point bend test, showed slight advantages in using a weld wire with a lower percentage of titanium and in welding the plate in the aged condition. However, multiple weld repairs may cause as much as a 28-percent decrease in weld toughness. The greatest reduction in toughness was found in the plates that had three aging cycles: one before welding, one after welding, and the third after welding repairs had been made. Author (TAB)

N71-14819*# Douglas Aircraft Co., Inc., Huntington Beach, Calif. Missile and Space Systems Div.

FLAT CABLE APPLICATIONS ENGINEERING STUDY, PHASE 3, VOLUME 1 Final Report

Jul. 1968 240 p refs

(Contract NAS8-20751)

(NASA-CR-102525; DAC-56659-Vol-1) Avail: NTIS CSLC 13I

Research efforts are described in developing a practical, efficient, and reliable shielded flat-cable and termination method, establishing specifications for production type, flat-cable system components which meet or exceed aerospace qualification, and preparation of a flat-cable handbook suitable for use by all engineering, manufacturing, and inspection technologies. R.B.

N71-14848*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OPTIMIZATION OF SELF-ACTING HERRINGBONE

JOURNAL BEARINGS FOR MAXIMUM RADIAL LOAD CAPACITY

Bernard J. Hamrock and David P. Fleming [1971] 22 p refs Proposed for presentation at the 4th Gas Bearing Symp., Southampton, England, 23–26 Mar. 1971
(NASA-TM-X-52945) Avail: NTIS CSCL 13I

A computer program was developed to determine optimal self-acting herringbone journal bearings. Design curves enable one to find the optimal herringbone journal bearing for a wide range of operating conditions. These range from incompressible lubrication to a highly compressible condition, for either smooth or groove members rotating, and for legnth to diameter ratios of 1/4, 1/2, 1 and 2. The analysis is valid for small displacements of the journal center from the fixed bearing center, and for a large number of grooves. Author

N71-14889*# AeroJet-General Corp., Sacramento, Calif. Nuclear Div.

WELDABILITY EVALUATION OF THICK SECTIONS OF HASTELLOY X WITH VARYING ALUMINUM CONTENT. NERVA PROGRAM

C. W. Fletcher Jul. 1969 10 p ref
(Contract SNP-1)
(NASA-CR-115886; RN-S-0519) Avail: NTIS CSCL 13E

Hot cracking and poor wetability of the molten weld metal presented problems in welding the thick sections of the Hastelloy X Phoebus 2 nozzle. A program was conducted to evaluate the effect of varying percentages of aluminum on the weldability of Hastelloy X. The results indicate that lowering the aluminum content of Hastelloy X improves weldability. Utilization of the low-aluminum Hastelloy X material for the NERVA nozzle should result in improved weld quality and lower welding costs. Author (NSA)

N71-14890*# Union Carbide Corp., Parma, Ohio. Carbon Products Div.

DEVELOPMENT OF SEAL RING CARBON-GRAPHITE MATERIALS, TASKS 1 AND 2

N. J. Fechter and P. S. Petrunich [1970] 118 p refs
(Contract NAS3-13211)
(NASA-CR-72799) Avail: NTIS CSCL 11A

Four material formulations, from which seal ring carbon-graphite bodies with a performance goal of 3000 hours life at air temperatures to 1300 F are to be produced, were ultimately developed after preparation and characterization of twelve material systems and forty-seven material subsystems. The material systems and subsystems employed four particulate and four binder raw materials selected after a literature search. Experimental results show: The oxidation rate of carbon-graphite bodies baked to 2800 C and prepared with a particulate system which contains a high concentration of relatively pure graphite is significantly lower than that of a commercial grade typical of current practice. The strength and hardness of these materials are lower than that of the commercial grade. The phenolic resin and coal tar pitch studied were more effective as binders than the furfuryl alcohol and polyphenylene sulfide resin. Graphite fibers can be used as an admixture for strengthening compacts prepared with an artificial graphite filler. Author

N71-14930# Bureau of Mines, Albany, Oreg. Metallurgy Research Center.

ROLL FORMING STRIP FROM OXIDE POWDERS

Henry M. Harris, Bob L. Forkner, and Hal J. Kelly Dec. 1970 28 p refs
(BM-RI-7463) Avail: Issuing Activity

High quality porous or dense alumina, zirconia, and porcelain shapes were made by sintering strip roll-formed at room temperature from powders containing minor amounts of binder and water. Strips with thicknesses of 0.04 to 0.08 inch and bulk densities from 40% to 90% of theoretical densities were made. The parameters most important to formability were particle size, condition of the powders, and roll gap. Other factors affecting quality were speed and surface condition of the rolls, amount and type of binder, water content, and sintering conditions. Ceramic strip was formed at rates up to 78 ft/min, and forming was done in a simple and inexpensive roll unit. Reshaping the strip was possible by cutting, grinding, shearing, and stamping. The following innovations were developed: Fine-sized powders were made into strip by preparing these as partially sintered granules; thick strip was formed by pressure feeding powders into the rolls; flexible strip was made using a rubber-base bonding agent; corrugated strip was formed on shaped rolls; and porcelain strip was densified and reduced in thickness by rerolling while hot. Author

N71-14931*# AeroJet Liquid Rocket Co., Sacramento, Calif. Liquid Rocket Div.

APOLLO SERVICE PROPULSION SYSTEM ROCKET ENGINE BIPROPELLANT VALVE IMPROVEMENT PROGRAM, PHASE 1

Jul. 1970 112 p
(Contract NAS9-8317)
(NASA-CR-114790; Rept-8317-PI) Avail: NTIS CSCL 13K

Design studies and subcomponent level development tests for the improved bipropellant valve are reported. It is concluded that the modular bipropellant valve assembly concept with cam lifted seals is feasible. The concept of the modular cam lifter seal design is considered adequately demonstrated. The two-bore valve actuators and associated gearing performed satisfactorily during testing. The lifted seal concept results in a significant improvement in life and sealing capability. Axial seal displacement is preferable to the bending seal concept. Dual ball seals add to reliability, but also add complexity and cost. Tests with both the oxidizer and fuel cartridges showed a reduction in leak rate after the initial cycling. Initial run-in of cams is critical and a light film of Teflon is beneficial while the cams and followers are seating in. Author

N71-14932* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SPLIT WELDING CHAMBER Patent

Richard A. Terselic and Louis Rosenblum, inventors (to NASA) Issued 3 Feb. 1970 (Filed 1 Jun. 1967) 5 p Cl. 219-72; Int. Cl. B23k9/16, 35/38, 9/00 Continuation-in-part of US Patent Appl. SN-364862, filed 4 May 1964
(NASA-Case-LEW-11531; US-Patent-3,493,711; US-Patent-Appl-SN-643332) Avail: US Patent Office CSCL 13H

A portable vacuum chamber for electron beam welding is described. The welding head is rotatable 360 deg, and the chamber has ports for viewing the inside, insertion of electrial leads, and connecting the evacuating apparatus. The housing can be easily dissembled and reassembled, and sealing means are provided between the chamber sections and around bores. The apparatus can be used for welding a wide variety of shapes, including a closed loop of solid rod or tubing. N.E.N.

N71-14941*# Aerojet-General Corp., Sacramento, Calif. Nuclear Rocket Operations.

EVALUATION OF CONSUMABLE WELD INSERTS FOR NERVA LINE WELDS. PROGRAM NERVA

C. W. Fletcher Jun. 1969 18 p
(Contract SNP-1)
(NASA-CR-115885; RN-S-0515) Avail: NTIS CSCL13E

Three types of consumable weld inserts were evaluated. Two types exhibited the best weldability characteristics and minimum weld shrinkage for the tube wall thickness utilized in the program. Complete fusion of the insert and uniformity of underbead contour were difficult to achieve with the third type. A mixture of 85%

argon–15% hydrogen as the torch shielding gas, in combination with optimum ID weld backup shielding, consistently produced the smooth, contoured, low-crown underbead desired. Author (NSA)

N71-14997# Oak Ridge National Lab., Tenn.
PERFORMANCE TESTS ON A LABORATORY COLD ROLLING MILL
J. R. Gibson Sep. 1970 19 p refs
Contract W-7405-eng-26)
(ORNL-TM-3085) Avail: NTIS

Performance tests conducted on a small laboratory rolling mill designed for processing small quantities of isotopically pure metals are described. The mill is a 4-high design with 1/2-in. -dia tungsten carbide work rolls. The mill was tested for ultimate thickness of both direct and sandwich rolled samples and compared with existing equipment. Some samples were measured for uniformity. Results indicate an ability to produce thinner foils than previously available and with good uniformity as well. Author (NSA)

N71-15425# Naval Research Lab., Washington, D.C.
INFLUENCE OF COMPOSITION ON THE FRACTURE TOUGHNESS OF COMMERCIAL NUCLEAR VESSEL WELDS
Lendell E. Steele 11 Mar. 1970 20 p refs Presented at 2d Inter-Am. Conf. on Materials Technol., Mexico City
(Contract AT(49-5)-2110)
(NRL-7095; CONF-700812-1) Avail: NTIS

Weld joints of nuclear vessels are considered as potentially the weakest link in reliability. The fracture toughness of nuclear vessel welds has become the focal point for those concerned with the reliability of nuclear vessels. Irradiation studies of welds of the ASTM Type A302-B and A533-B steels, most commonly used for commercial water reactor vessels, have demonstrated several instances in which the weld metal exhibited lower fracture toughness or greater elevation of the brittle-to-ductile transition temperature than that observed for the companion base-plate and weld heat-affected-zone material. Examination of the structure and composition has led to the conclusion that composition is critical to the level of radiation-induced embrittlement. Author (NSA)

N71-15430# Bhabha Atomic Research Centre, Bombay (India).
MASKING MACHINE
Ramesh Chaudhry 1970 12 p
(BARC-483) Avail: AEC Depository Libraries

A versatile masking machine for use with work on fabrication of semiconductor detectors has been made. The machine can mask both rectangular and circular areas. The machine is also useful for applying epoxy resins for edge protections or encapsulation of semiconductor detectors. A vacuum hold mechanism is incorporated in the machine for holding the crystal at its platform. Details of facilities and the fabrication of the masking machine are presented. Author (NSA)

N71-15431# Dow Chemical Co., Golden, Colo. Rocky Flats Div.
MACHINABILITY OF PLUTONIUM
Charles E. Durbin 20 Jul. 1970 47 p
(Contract AT(29-1)-1106)
(RFP-1428) Avail: NTIS

Experiments were undertaken to provide significant data, scarce in the literature, on the cutting processes used for machining delta plutonium. To the extent possible, the optimizing of machine parameters was considered important in obtaining the best results. Reported in detail are the various effects of tool geometry and cutting conditions. Equipment and uses are described also. Data analyses, procedures, and graphic interpretations are given as plotted data of tool force, isoforce contour, total tool force, and total isoforce contours versus various parameters. In addition, a slide rule technique with a sample rule are presented for determining tool forces, surface finishes, and removal rates. Author (NSA)

N71-15432# Naval Ordnance Lab., White Oak, Md.
A GUIDE FOR ULTRASONIC TESTING AND EVALUATION OF WELD FLAWS Final Report
R. A. Youshaw Aug. 1970 23 p refs Revised
(AD-713202; NOLTR-70-85-Rev; SSC-213-Rev) Avail: NTIS CSCL 13/8

The document presents procedures and acceptance limits for contract ultrasonic inspection of steel but welds in the thickness range of 1/4 to 2 inches. The acceptance limits described are compatible with those set forth in SSC-177, Guide for Interpretation of Nondestructive Tests of Welds in Ship Hull Structures for radiographic inspection and should therefore result in satisfactory ship welds. Author (TAB)

N71-15433# Royal Aircraft Establishment, Farnborough (England).
THE ROLE OF THE COUNTERFACE IN THE FRICTION AND WEAR OF CARBON FIBRE REINFORCED THERMOSETTING RESINS
J. P. Giltrow and J. K. Lancaster Jun. 1970 28 p
(RAE-TR-70115) Copyright. Avail: NTIS

The tribiological properties of carbon fiber reinforced resins are determined by the interrelated effects of two major factors: (1) the type of carbon fiber and (2) the nature of the counterface material. Fiber orientation, the matrix resin, and the presence of third components are of little significance. The behavior of two types of carbon fiber composites is discussed and the effects of the counterface on both types of fibers is described. Author

N71-15434# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TEMPERATURE STABILITY OF LUBRICATION LAYERS DURING FRICTION OF ALLOYED ALUMINUM ON STEEL
R. M. Matveevskii et al 28 Aug. 1970 19 p refs Transl. into ENGLISH from Mashinovedenie (USSR), no. 6, 1968 p 78–85
(AD-713770; FTD-HT-23-288-70) Avail: NTIS CSCL 11/8

The effect exerted by various alloying elements added to AV000 aluminum on the thermal stability of the outer layer formed by D-1 lubricating oil containing 0.1 percent stearic acid was studied. The oil was spread on the aluminum surface during the frictional motion of a ShKh-9 steel ball on a circular aluminum bearing race. The chemical composition and some of the mechanical properties of the experimental specimens are summarized. All the experiments were conducted within the temperature interval of 20-360C, with the temperature changed in steps of 10-20C and the duration of each temperature step approximately 1 min. The addition of alloying elements increased the thermal longevity of the outer lubricating layer, the magnitude of the effect being proportional to the concentration of the added alloying element. TAB

N71-15449# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBLEM OF FRICTION IN DIAMOND HONING
L. A. Khvorostukhin et al 26 Jun. 1970 13 p refs Transl. into ENGLISH from Izv. Vysshikh. Uchebn. Zavedenii. Mashinostr. (USSR), no. 7, 1969 p 139–143
(AD-712802; FTD-HT-23-232-70) Avail: NTIS CSCL 13/8

The work examines friction characteristics during the diamond honing of six steel grades. A relationship is established between physico-Mechanical characteristics of machined material, optimal honing regimes, and mean friction coefficients. Experimental data are presented on the influence of lubricating and cooling liquids on the friction coefficients. Author (TAB)

N71-15456# Joint Publications Research Service, Washington, D.C.
EXPERIMENTAL USE OF FIRE-RESISTANT TURBINE OIL IN TURBOGENERATOR REGULATING AND LUBRICATING SYSTEM
K. I. Ivanov et al 8 Dec. 1970 6 p refs Transl. into ENGLISH from Teploenergetika (Moscow), v. 19, no. 8, 1969 p 30-32
(JPRS-51949) Avail: NTIS

The use of high-parameter steam (500 C and above) in contemporary power engineering increases the danger of fires at power plants due to the self-ignition of petroleum turbine oil. The possibility of the spontaneous combustion of oil also increases in connection with the trend toward higher pressure in the control systems of powerful steam turbines, which increases the probability of rupture of oil lines during hydraulic shocks and the spraying of oil onto hot surfaces. This explains the growing interest in various countries in the search for and adoption of fireproof substitutes for turbine oils, first for control systems, and then for the lubrication systems of steam turbines. Author

N71-15457# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATION OF THE EFFECTIVENESS OF ULTRASONIC VIBRATIONS OF THE TOOL WHEN MACHINING HEAT-RESISTANT AND TITANIUM ALLOYS
M. S. Nerubai 20 Aug. 1970 20 p refs Transl. into ENGLISH from Aviats. Inst., Kuibyshev, Tr. (USSR), no. 18, 1963 p 15-27
(AD-713455; FTD-MT-24-162-70) Avail: NTIS CSCL 13/8

The study, employing forced ultrasonic radial vibrations, was carried out in a specially built set-up on maintaining a constant vibration frequency of 21 kilocycles. Analysis of the findings revealed that in this event machining is accompanied by a marked decrease in the longitudinal shrinkage factor (presence of thinner chips) as well as by the absence of burrs. Then the tool feed rate exceeds 0.4 mm/revolution, the temperature during conventional machining was the same as during machining accompanied by the application of ultrasonic vibrations, but in both cases burrs were absent. Depending on the vibration amplitude ultrasonic vibrations may raise or lower the mean temperature in the machining zone. Thus the excitation of ultrasonic vibrations of large and given medium amplitudes raises the temperature in the machining zone for VTZ-1 titanium alloy, particularly in the presence of low tool feed rates, while in the range of double amplitudes 0.003-0.006 mm it lowers the temperature by 40-60 degrees centigrade. Similar findings were made for E787 and St.45 steels. Author (TAB)

N71-15537# National Science Foundation, Washington, D.C.
ELECTROCRYSTALLIZATION OF METALS IN AN ULTRASONIC FIELD
A. P. Kapustin et al 1970 66 p refs Transl. into ENGLISH of the publ. 'Elektrokristallizatsiya Metallov v Ultrazuukovom Pole' Miscow, Iz-Vo, 1969 Sponsored by NBS
(TT-70-50036) Copyright. Avail: NTIS CSCL 13H

The ways in which ultrasound influences electrode processes and the properties of electrodeposits are discussed. The investigations of the effect of ultrasound on the cathodic distributions of current and metal during electrocrystallization of copper, nickel, and zinc from aqueous solutions are described. In addition, the results of some experiments on the effects of ultrasound on the following are also presented: (1) electrode polarization; (2) electrolyte conductivity; (3) current efficiency and structure, microhardness, and (4) porosity of electrodeposits. Author (USGRDR)

N71-15571* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
ADJUSTABLE ATTITUDE GUIDE DEVICE Patent
Joseph V. Boyle, Jr., inventor (to NASA) Issued 3 Feb. 1970 (Filed 11 Aug. 1967) 4 p Cl. 33-207; Int. Cl. G01c9/02; Int. Cl. F16m11/24
(NASA-Case-XLA-07911; US-Patent-3,492,739; US-Patent-Appl-SN-660572) Avail: US Patent Office CSCL 13I

A guide block having three independently adjustable legs each having a major portion extending from the guide block substantially parallel to the horizontal and a minor portion extending substantially perpendicular from the major portion is described. The guide block, having perpendicularly disposed level vials, is useful in seating pins perpendicular to an irregular convex work surface. The guide block exhibits a high degree of stability in the selected position and a high degree of precision in its operation. NASA

N71-15578# Royal Aircraft Establishment, Farnborough (England).
A REVIEW OF PNEUMATIC PISTON TYPE ACTUATORS FOR PROSTHETICS
A. G. Earl Apr. 1969 33 p ref Revised
(RAE-TR-68027-Rev) Copyright. Avail: NTIS

The gas consumptions of several arrangements of piston type actuators when operating under various loads are calculated. It is shown that a differential area type actuator operating with the piston rod normally in tension is markedly more economical than other arrangements, particularly when operating against unidirectional loads. When operating against bidirectional loads this design still uses less gas than a conventional double-acting actuator. Several recommendations are made on design aspects as a result of the practical implications revealed by these calculations. Author

N71-15588*# General Electric Co., Cincinnati, Ohio. Nuclear Systems Program.
DEVELOPMENT OF OPTIMUM FABRICATION TECHNIQUES FOR BRAZED TANTALUM/TYPE 316 STAINLESS STEEL TUBULAR TRANSITION JOINTS Final Report
S. R. Thompson, J. D. Marble, and R. A. Ekvall [1970] 104 p refs
(Contract NAS3-11846)
(NASA-CR-72746; GESP-521) Avail: NTIS CSCL 13H

Optimum techniques were developed for the brazing and ultrasonic inspection of tantalum/type 316 stainless steel, tongue-in-groove design, tubular transition joints. Experiments were conducted, which established those brazing conditions most conducive toward elimination of braze microshrinkage in the joint areas. Ultrasonic inspection methods were developed for measuring the quality of the brazed joints. Twelve 2-inch-OD joints for subsequent evaluation testing and usage in the SNAP-8 Power Conversion System were brazed and found satisfactory by implementation of the developed ultrasonic method of inspection. Author

N71-15597* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
METHOD AND APPARATUS FOR MAKING CURVED REFLECTORS Patent
Austin F. Reader, Walter E. Russell, and Edward A. Werner, inventors (to NASA) Issued 20 Jan. 1970 (Filed 23 Aug. 1967) 6 p Cl. 113-116; Int. Cl. B21d51/04, 51/10, 31/06, 35/00
(NASA-Case-XLE-08917; US-Patent-3,490,405; US-Patent-Appl-SN-662829) Avail: US Patent Office CSCL 20F

A method of fabricating and forming each curved segment of a light weight mirror by polishing one surface of a flat magnesium plate and then machining stiffening ribs in the other side is described. Each plate is accurately formed on a single mold with the application of heat and pressure after the machining. Official Gazette of the U.S. Patent Office

N71-15606* Computer Control Co., Inc., Framingham, Mass. Jet Propulsion Lab.
SUPPORT STRUCTURE FOR IRRADIATED ELEMENTS Patent
Anthony J. Nasuti, inventor (to NASA) Issued 3 Feb. 1970 (Filed 26 Oct. 1966) 4 p Cl. 250-52; Int. Cl. G01n23/20; Int. Cl. H01j37/26 Sponsored by NASA
(NASA-Case-XNP-06031; US-Patent-3,493,746; US-Patent-Appl-SN-590144) Avail: US Patent Office CSCL 20K

A structure for supporting a plurality of small, pellet-sized elements for simultaneous exposure to X-ray radiation is described. The structure includes a tube, of a material which is permeable to X-ray radiation, in which the elements to be irradiated are located at different axial positions along the tube. The tube, which is disposed in the path of the radiation from an X-ray source towards an X-ray sensitive plate, is manually rotatable about its longitudinal axis, so as to control the orientations of the irradiated elements in the radiation path.
Official Gazette of the U.S. Patent Office

N71-15607* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPARATUS FOR WELDING TORCH ANGLE AND SEAM TRACKING CONTROL Patent
William A. Wall, Jr. and Vaughn H. Yost, inventors (to NASA) Issued 13 May 1969 (Filed 7 Aug. 1967) 11 p Cl. 228-7; Int. Cl. B23k3/00, 9/12
(NASA-Case-XMF-03287; US-Patent-3,443,732; US-Patent-Appl-SN-658956) Avail: US Patent Office CSCL 13H

An apparatus for automatically maintaining a welding torch at a desired angle to the work and a constant welding speed is described. An electrical computer is used to make the necessary adjustments caused by the shape of the work surface based on the relationship of the carriage velocity, actuator arm velocity, and welding velocity.
Official Gazette of the U.S. Patent Office

N71-15608* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
FLUID FLOW RESTRICTOR Patent
Gilbert J. Bastien, inventor (to NASA) Issued 3 Feb. 1970 (Filed 15 Sep. 1967) 6 p Cl. 138-42; Int. Cl. F25b41/06; Int. Cl. F15c4/00 Sponsored by NASA
(NASA-Case-NPO-10117; US-Patent-3,493,012; US-Patent-Appl-SN-668238) Avail: US Patent Office CSCL 20D

A tubular flow restrictor adapted to be inserted into a gas conduit to control the flow rate is described. It consists of capillary tubing of known viscous flow resistance wound helically onto a spool with each end of the tubing extending into an aperture through the opposite end flanges of the spool. A standard coupling is connected at each end of the spool in alignment with the ends of the capillary tubing for connection of the device into a gas line to provide a known resistance to flow. The capillary tubing is encased in a thermal insulating resin. In one embodiment, a plurality of lengths of the capillary tubing of different flow resistances are wound on the same spool and have their ends extending through the flanges at spaced points. The spool is rotatable relative to an inlet and outlet to register any selected length of capillary tubing with the inlet and outlet.
Official Gazette of the U.S. Patent Office

N71-15609* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MULTIWAY VORTEX VALVE SYSTEM Patent
Jerry A. Peoples, inventor (to NASA) Issued 3 Feb. 1970 (Filed 16 Nov. 1967) 7 p Cl. 137-81.5, Int. Cl. F15c1/08
(NASA-Case-XMF-04709; US-Patent-3,493,003; US-Patent-Appl-SN-683507) Avail: US Patent Office CSCL 13K

A pure fluid device composed of a plurality of vortex amplifiers, each connected to a common power jet stream and connected to a common control jet stream, was developed. Orifices on each vortex amplifier control jet stream conduit are partially or completely closed simultaneously by one control rod thereby varying the pressure and velocity of each vortex amplifier's control jet stream. Proportionate amplification of each vortex amplifier output is obtained allowing the integrated pure fluid device to function as a proportional multi-output amplifier.
Official Gazette of the U.S. Patent Office

N71-15610* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD OF MAKING A DIFFUSION BONDED REFRACTORY COATING Patent
Salvatore J. Grisaffe and William A. Spitzig, inventors (to NASA) Issued 3 Feb. 1970 (Filed 16 Nov. 1967) 6 p Cl. 117-50; Int. Cl. C23c13/00 Continuation-in-part of US Patent Appl. SN-338326, filed 7 Jan. 1964
(NASA-Case-XLE-01604-2; US-Patent-3,493,415; US-Patent-Appl-SN-683613) Avail: US Patent Office CSCL 11C

A method for forming a diffusion bonded coating on a substrate is described. The substrate to be coated is cleaned, polished and then heated to between 1/4 and 4/5 of its melt temperature by the plasma from a metal spraying gun in a chamber which has been back-filled with an inert gas. Powdered metal or ceramic is then fed to the plasma and sprayed onto the heated substrate.
Official Gazette of the U.S. Patent Office

N71-15617# Bendix Corp., Kansas City, Mo.
FLATPACK REFLOW SOLDERING
D. W. Bowlen and E. Hollingsworth Aug. 1970 39 p
(Contract AT(29-1)-613)
(BDX-613-141) Avail: NTIS

Problems encountered in the use of parallel-probe resistance-soldering for installing IC flatpacks on printed wiring boards were examined using suitable reflow soldering methods. The principal goals were increased production rates, more uniform solder fillets, reduced rework, and greater process versatility. Soldering processes investigated included a multilead heated probe, for soldering several leads simultaneously; infrared heating, also permitting simultaneous lead soldering, and a single heated probe, whereby leads are soldered individually. Neither the multilead probe nor the infrared method provided any appreciable advantage, and both methods were less satisfactory than the previously used parallel probes. The single-probe method, however, provided most of the improvements sought. Production rates were increased significantly, solder fillet uniformity was improved, and rework was sharply reduced. Therefore, the single-probe system was adopted for use in current scheduled production of printed wiring board assemblies which contain flatpacks.
Author

N71-15628*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ROLLING-CONTACT BEARING: REFERENCE SUMMARY Final Report
William A. Glaeser, David B. Cox, Keith F. Dufrane, and Jerrold W. Kannel Sep. 1969 123 p refs Prepared by Battelle Memorial Inst.
(Contract DAAH01-67-C-1921)
(NASA-TM-X-66477; AD-698472; RSIC-932) Avail: NTIS CSCL 13I

The reference summary contains information concerning the design and performance of rolling-contact bearings (ball bearings, roller bearings, and needle bearings). It is broken down into five general topics: (1) principles of rolling contact bearings, (2) lubricants and materials, (3) special aerospace bearing applications, (4) failure diagnosis, and (5) future trends in rolling-contact bearing lubrication. Special design and operating conditions encountered in

aerospace applications are emphasized, such as high speed, high temperature, hard vacuum, cryogenic temperatures, and oscillating motion. Various lubricants used in rolling-contact bearings, including oils, greases, solid lubricants, and special lubricants for an aerospace environment are discussed and evaluated. Author (TAB)

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid State.

N71-14546# Naval Intelligence Command, Alexandria, Va. Translation Div.

OPTICALLY PUMPED GASDYNAMIC MOLECULAR LASER [GAZODINAMICHESKY MOLEKULYARNYY LAZER S OPTICHESKOY NAKACHKOY]

V. A. Batanov et al 21 Oct. 1970 5 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 191, no. 6, 1970 p 1267-1269

(AD-713275; NIC-Trans-3127) Avail: NTIS CSCL 20/5

The advantages of molecular gases in lasers with noncoherent optical pumping are well known and conditioned on the one hand 1by a relatively broad spectral pumping-light absorption band, and on the other by a relatively narrow working-transition line width. One such laser - the photodissociation laser - has been in existence for a long time already. The present paper proposes an infrared molecular laser with optical pumping to the vibrational-rotational band of the molecule in the electron ground state, and noncoherent emission from an immovable shock wave, arising during steady escape of the working mixture from the nozzle under conditions of incomplete expansion of the gas into the atmosphere. The composition of this gas can either correspond or not with that of the working mixture. Everywhere below, for simplicity, by working mixture the authors mean the mixture $CO_2 + N_2 + He$. In this, helium plays the same role as in CO_2 lasers with electrical discharge. The nitrogen mixture is not necessary to achieve inversion, but it proves favorable, laser level and, secondly, to expansion of the vibrational-rotational pumping absorption band. TAB

N71-14564# Minnesota Univ., Minneapolis. Dept. of Electrical Engineering.

INFRARED DETECTORS, LASER TECHNOLOGY AND SIGNAL PROCESSING Annual Report, 1 Sep. 1969-30 Aug. 1970

R. J. Collins Sep. 1970 98 p refs

(Grant N00014-68-A-0141-0002)

(AD-713223; AR-3) Avail: NTIS CSCL 20/5

During the third year of the grant research was carried out in the areas of CO_2 laser technology, photoelectric detection in the near infrared, the helium-neon-cadmium laser system, mass spectroscopy of CO_2:N:He discharges, optical heterodyning, optically induced scattering in solids, and studies on mixtures of formic acid and nitrogen forming a CO_2 laser by dissociation. In the sections of the report summaries of each phase is given. The measurement of gain profiles in CO_2 lasers has lead to the construction of a high gain CO_2 amplifier, and detailed knowledge of the generation of multiple beams in solids through optically induced phase gratings. Author (TAB)

N71-14670# Tetra Tech, Inc., Pasadena, Calif.

SEARCH FOR A FOUR-MICRON MOLECULAR LASER Final Report, 15 Apr. 1968-31 Jul. 1970

John M. Flournoy Sep. 1970 28 p refs Sponsored in part by ARPA

(Contract N00014-68-C-0423; Proj. Defender)

(AD-713193; TT-TC-138-1) Avail: NTIS CSCL 20/5

Experiments have been conducted in an effort to achieve continuous laser action in HCN, which has a vibrational transition at 3.86 microns, a wavelength which falls well within the atmospheric window just below 4 microns. Indirect excitation of the upper level (the C-H stretching fundamental) was accomplished by collisions with vibrationally excited hydrogen, deuterium, and nitrogen, without apparent decomposition of the HCN, which is known to suffer extensive decomposition when exposed to an electric discharge. The upper level (001) was identified by infrared emission spectroscopy, and its concentration was estimated to be several per cent at a pressure of 0.05 torr of HCN and 1 torr of discharge-excited H_2. No oscillations were observed with HCN excited by H_2 or N_2 in a 1-meter flowing laser system even when dry-ice cooling was used to reduce the population of the lower (010) level, which is the bending fundamental. Author (TAB)

N71-14680# Forsvarets Forskningsanstalt, Stockholm (Sweden). Avdelning 2.

LASER GYRO: AN EXPERIMENTAL DEMONSTRATION [LASERGYRO: ETT DEMONSTATIONSEXPERIMENT]

Kurt Bergvall, Britt Hartmann, and Georg Spangstedt Aug. 1969 28 p refs In SWEDISH

(FOA-2-C-2336-51) Avail: NTIS

The laser gyro effect was demonstrated at 1.15 micron in a simple demonstration arrangement. The principles for laser gyro function and properties are briefly discussed. The practical construction and alignment of the beam path is described. In order to simulate rotation, a Faraday cell can be used in the laser gyro ring. Details of the mode of operation of a Faraday cell are given in an appendix. Author

N71-15026*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

OPERATION MANUAL FOR THE MARK 2 MODEL OF THE LASER ABSOLUTE GRAVIMETER

William M. Greene 29 Oct. 1970 82 p refs

(NASA-TM-X-64560) Avail: NTIS CSCL 20E

An absolute gravimeter utilizing the principle of a Michelson interferometer is currently undergoing development at NASA's Marshall Space Flight Center, Huntsville, Alabama. The current model, Mark 2, is a second generation of the original Mark 1 laser absolute gravimeter. Its description, operation, principles of operation, alignment, and maintenance are presented. Author

N71-15035# Atomic Energy Commission, Washington, D.C.

LASER APPLICATIONS FOR HIGH-SPEED INVESTIGATIONS OF FAST PROCESSES

G. V. Sklizkov Sep. 1970 33 p refs Transl. into ENGLISH from Russian report FIPNL-29

(AEC-tr-7166; FIPNL-29) Avail: NTIS

A review-type discussion for the use of lasers as light sources is given: (1) photography in slit scanning mode, (2) frame photography with photorecorder frame separation, (3) frame photography with light delay, (4) ultrashort exposures, (5) fast optical shutters, (6) laser plasma as a light pulse source, (7) high-speed interferometric photography, and (8) high-speed Schlieren photography. NSA

N71-15136*# Radiation, Inc., Ann Arbor, Mich. Electro-Optics Center.

INVESTIGATION OF OPTICAL MEMORY TECHNIQUES Final Report, 1 Jul. 1969-30 Jun. 1970

A. A. Friesman Oct. 1970 269 p refs

(Contract NAS12-2200)

(NASA-CR-102973; EOC-8101-12-F) Avail: NTIS CSCL 20E

The feasibility of using holographic techniques for a 10 sup 10 to 10 sup 12 bit read/write optical memory, having no moving parts, is investigated. Although the main objective is to

evaluate various holographic techniques and to determine a suitable storage material, other components of the system such as the block data composer, the photodetector array, the deflection and scanning devices, and the coherent light source are also discussed. Several approaches and designs for implementing the major elements of the system are suggested. After selecting promising approaches, two specific holographic memory designs of 10 sup 9 and 10 sup 10 bits total capacities and 10 sup 8 bits/second data rates are described. The major differences between the two designs are that one uses a thin storage material such as photoplastic or MnBi whereas the other uses a thick phase storage material and a multiwavelength laser. Both designs use input block data composers and photodetector arrays containing 256 × 256 elements and acousto-optic beam deflectors. A list of requirements for a suitable storage material and recommendations for future development of the holographic memory system are given. Author

N71-15157# Weapons Research Establishment, Salisbury (Australia).
THE APPLICATION OF HOLOGRAPHIC INTERFEROMETRY TO THE MEASUREMENT OF VERY SMALL DISPLACEMENTS OF A SURFACE
R. G. Hughes Apr. 1970 63 p refs
(WRE-TN-OSD-115) Avail: NTIS

The measurement of very small surface deformations was carried out using optical wavefront reconstruction. The theory of holographic interferometry is first presented and then a series of experiments is described. A test surface was irradiated by coherent laser light and the wave scattered from the surface was recorded as a hologram on a photographic plate. The test surface and hologram were then irradiated by the laser light in the same manner as for the recording stage so that the wavefront scattered from the surface was superposed on the reconstructed wavefront which issued from the hologram. The fringe pattern seen across the test surface was produced by the interference of these two wavefronts. Author

N71-15158# Weapons Research Establishment, Salisbury (Australia).
LASER RESONATORS, PROPERTIES OF LASER BEAMS AND DESIGN OF OPTICAL SYSTEMS Final Report
B. A. See Apr. 1970 61 p refs
(OSD-18) Avail: NTIS

A review of the theory of laser resonators as derived from the scalar wave equation is given following the treatment of Kogelnik and Li. The treatment is extended to generalised multimode beams by taking as the limit of the beam the cut-off radius specified by the aperture which limits the beam. The method may be used to design resonators having specified properties to match desired optical systems. Author

N71-15222# Frankford Arsenal, Philadelphia, Pa.
OPTIMIZATION ANALYSIS OF A COMPACT LIGHTWEIGHT LASER RANGEFINDER
Joseph Costantino, Carmen Pontelandolfo, and Donald Resgo 1970 10 p refs
(AD-713517) Avail: NTIS CSCL 20/5

The purpose of the paper is to describe the optimization methods used to achieve a laser rangefinder design that would be suited for use in mortar fire control. Author (TAB)

N71-15232# Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant.
AN AUTOMATIC LEVEL COMPENSATION SYSTEM FOR LASER INTERFEROMETERS
W. A. Baldauf, Jr. 21 Aug. 1970 32 p refs
(Contract W-7405-eng-26)
(Y-1737) Avail: NTIS

A system was designed which will automatically compensate for signal dc level drift in a laser interferometer system. A prototype of the system was built and put into an interferometer system where it has proved to be capable of meeting the design requirements. Author (NSA)

N71-15343# Boeing Scientific Research Labs., Seattle, Wash.
GAIN MEASUREMENTS IN A RAPID GAS DYNAMIC EXPANSION
A. L. Hoffman, G. J. Mullaney, M. T. Holden, and A. L. Pindroh Oct. 1970 22 p refs
(AD-713497; D1-82-1008) Avail: NTIS CSCL 20/5

A double expansion nozzle was used in a shock tube facility to study the population inversions achieved in a CO2 lasing gas mixture. For these experiments the double expansion nozzle, a form of gas-dynamic throttle, was a means for increasing the gain path length in the shock tube apparatus by a factor of five. Gain measurements were made for various reservoir conditions of temperature (1000 < or = T(0) < or = 2600K) and pressures after final expansion through a Mach = 4, twenty-nine element, multiple nozzle to (5 < or = p < or = 100 torr). The small signal gain is a function of the population inversion in the non-equilibrium flow and the line broadening. Measurements were made in both the collision and Doppler broadened regions. Numerical computations were made based on available relaxation rates and compared with experiment. Evaluations of the accuracy of these rates were made, and in the case of the depopulation of the lower laser state due to helium it was found that the V-T rate is faster than previously thought. Thus, gain measurements in a gas dynamic expansion can actually be used to measure relaxation rates. Author (TAB)

N71-15362# Army Weapons Command, Rock Island, Ill.
HOLOGRAPHIC INSPECTION OF LAMINATE BONDS
R. J. Iverson, J. W. McGarvey, and L. B. Gardner 1970 14 p refs
(AD-713545) Avail: NTIS CSCL 14/2

The paper discusses the holographic detection of bonding voids in rubber-to-metal, plastic-to-metal, and metal-to-metal laminates by observation of stress-induced deformations of the laminate surface. Author (TAB)

N71-15368# Army Missile Command, Redstone Arsenal, Ala.
CO2 LASER PULSING PRODUCED BY CAVITY-LENGTH MODULATION
Albert L. Pardue, Jr. 1970 15 p refs
(AD-713570) Avail: NTIS CSCL 20/5

It is apparent that the reactive Q-switching pulsing in the CO2 laser is not restricted to the conventional straight laser where only one mode oscillates at a given instant. In the conventional laser the restriction to one such mode appeared to be the major factor. However, the lengthening of the laser cavity in the multipass CO2 laser provided similar pulse widths and repetition rates. Even at low mirror velocities (about 0.5 cm/sec), pulsing was found to be repetitive in waveform shape and amplitude, whereas under similar conditions in the conventional straight laser, irregular pulsing was observed. Author (TAB)

N71-15389# Army Electronics Command, Fort Monmouth, N.J. Electronic Components Lab.
THRESHOLD EFFECTS OF CHEMICAL MIXTURES IN THE HCN LASER
George E. Morris, Harold Jacobs, Charles S. Brand, and Thomas R. Mooney 1970 14 p refs
(AD-713562) Avail: NTIS CSCL 20/5

The discovery of the HCN laser has given scientists, for the first time, an inexpensive coherent source in the submillimeter region of the spectrum. Experiments are described there various chemicals were added to the basic laser fuel, CH3CN (acetonitrile),

in the HCN laser. Laser output power at 337 milimiters wavelength and current threshold, (minimum current necessary for oscillation) were monitored. Results include increased power and efficiency with the addition of CO2 or O2 to the discharge. Experiments also include the characterization of the HCN laser output over a wide range of pumping speeds. Increased pump speed resulted in increased power; however, power saturation occurred at higher pumping speeds. From these results one can obtain insight into the basic mechanism of the HCN laser and develop possible means for improvement. Author (TAB)

N71-15474# Addis Translations International, Woodside, Calif. California Univ., Livermore. Lawrence Radiation Lab.
PASSIVE SPECTRAL METHOD
Jean Desbois et al Sep. 1970 6 p refs Transl. into ENGLISH from Compt. Rend., Ser. A, B. (Paris), v. 270, 1970 p 1604–1606 Prepared for Calif. Univ., Livermore. Lawrence Radiation Lab.
(UCRL-Trans-10486) Avail: NTIS

A method is proposed for obtaining light pulses of a desired shape lasting from between several dozen picoseconds and a few nanseconds by using the ultrashort pulses of mode-locking lasers. The broad-spectrum pulse passes through a dispersive structure, where it is stretched, and a spectral filtering gives it the desired shape. The emerging pulse is frequency-modulated according to the law appropriate to the disperser. Author

N71-15550* Microwave Electronics Corp., Palo Alto, Calif.
FOLDED TRAVELING WAVE MASER STRUCTURE Patent
Lyle D. Buchmiller, Robert W. De Grasse, William Pickney Jones, and William A. Peterson, inventors (to NASA) Issued 17 Jan. 1967 (Filed 3 Jan. 1964) 6 p Cl. 330-4 Sponsored by NASA
(NASA-Case-XNP-05219; US-Patent-3,299,364;
US-Patent-Appl-SN-336103) Avail: US Patent Office CSCL 20E

A traveling wave maser which includes at least one pair of waveguides in which a signal wave is amplified by stimulated emission of an active material is described. The waveguides are arranged side by side with a common separating wall and are coupled together for coupling the wave being amplified from one waveguide into the other. A resilient member is provided for each of the waveguides to hold the active material in each waveguide against the slow wave structures. The folded traveling wave maser will produce the same amount of amplification of the input signal in half the length required a continuous in-line maser. P.N.F.

N71-15551* National Aeronautics and Space Administration. Electronics Research Center, Cambridge, Mass.
FOCUSED IMAGE HOLOGRAPHY WITH EXTENDED SOURCES Patent
Lowell Rosen, inventor (to NASA) Issued 20 Oct. 1970 (Filed 20 Oct. 1967) 5 p Cl. 350-3.5, Int. Cl. G02b27/22
(NASA-Case-ERC-10019; US-Patent-3,535,013;
US-Patent-Appl-SN-677508) Avail: US Patent Office CSCL 20E

Holograms of real objects and focused aerial images using a coherent extended reference source illuminating the photographic plate can be readily produced. During the recording process, a ground glass is placed between a point source laser reference beam and the holographic plate. On reconstruction, a different extended source or point source can be used. During reconstruction with this technique, hologram or reference source misalignment is not critical. NASA

N71-15565* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HYBRID HOLOGRAPHIC SYSTEM USING REFLECTED AND TRANSMITTED OBJECT BEAMS SIMULTANEOUSLY Patent
Robert L. Kurtz and Burnice N. Norden, inventors (to NASA) Issued 20 Oct. 1970 (Filed 24 Feb. 1969) 5 p Cl. 350-3.5; Int. Cl. G02b27/00
(NASA-Case-MFS-20074; US-Patent-3,535,014;
US-Patent-Appl-SN-801312) Avail: US Patent Office CSCL 20E

A holographic system for dividing the coherent light beam into three paths is described. The beam is divided into a reference beam for direct transmission to a photographic plate, a direct signal beam for transmission to the photographic plate by transmission through or by the back side of the test object, and a reflection signal beam for transmission to the photographic plate by reflection from the front side of the object. The difference in the length of the three light paths is adjusted to be less than the coherence length of the light source. The orientation of the signal beams are positioned so that the change in the length of their paths during the exposure of a moving object will not adversely affect the interference pattern caused by (1) the reflection signal beam interfering with the reference beam and the direct signal beam, and (2) the direct signal beam interfering with the reference beam. To further decrease the mechanical stability requirements of the system, a light diffuser is placed in both the direct signal beam arm and the reflection signal beam arm.
Official Gazette of the U.S. Patent Office

N71-15567# National Aeronautics and Space Administration. Electronics Research Center, Cambridge, Mass.
RECORDING AND RECONSTRUCTING FOCUSED IMAGE HOLOGRAMS Patent
Lowell Rosen, inventor (to NASA) Issued 20 Oct. 1970 (Filed 20 Oct. 1967) 5 p Cl. 350-3.5; Int. Cl. G02b27/22
(NASA-Case-ERC-10017; US-Patent-3,535,012;
US-Patent-Appl-SN-677506) Avail: US Patent Office CSCL 20E

Holograms having quite unique properties are made by having the photographic plate illuminated by a light field coming from a lens-produced aerial image of a real object. This arrangement allows the aerial image to be placed as close to the hologram as desired without interfering with the reference beam, and even of placing the aerial image on the plate or behind it. The resultant focused image hologram of macroscopic objects, when illuminated by a reconstruction beam, can be seen with both eyes and hence in three dimensions. Also, a nonpseudoscopic real image with minimum aberrations and useful for projection can be produced.
Official Gazette of the U.S. Patent Office

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 08 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N71-14506# Frankford Arsenal, Philadelphia, Pa. Pitman-Dunn Research Labs.
THE USE OF MARTENSITE MATERIALS IN THE DESIGN OF THERMALLY ACTIVATED SPRINGS
Frederick Rothwarf, Arthur Auerbach, and Donald Ford 1969 15 p refs
(AD-713578) Avail: NTIS CSCL 11/6

The report presents a thermal analysis of heat activated metallic springs that could be utilized as fuse arming devices. TAB

N71-14518# British Steel Corp., London (England). Mechanical Working Div.
THE PRODUCTION OF STAINLESS STEEL STRIP FROM POWDER

G. M. Sturgeon, G. Jackson, V. Barker, and G. M. H. Sykes 1968 10 p refs Presented at the Ann. Meeting Powder Met. Joint Group of the ISI and Inst. of Metals, 13–15 Nov. 1968 (MW/HC/37/68) Avail: NTIS

Alternative production methods for stainless steel strip, initially in the size range 0.080–0.010 in, were examined. The production of Type-304L strip direct from water-atomized powder without the addition of bonding agents is described. The production cycle for powder-rolled strip consists of roll compaction using a saturated feed, sintering in line with the compaction mill, conventional cold reduction, and a final annealing treatment. Each stage is discussed, together with the final properties achieved. The main advantages of this production route lie in the elimination of ingot casting and hot rolling and their attendant cleaning and rectification processes. The ability to produce a range of green-strip thicknesses enables the amount of deformation to be reduced to that necessary to obtain the desired surface finish and mechanical properties. Experimental results are encouraging but considerable work remains to be done. Author

N71-14523# Watervliet Arsenal, N.Y. Benet R and E Labs.
THE EFFECT OF LOADING RATE AND TEMPERATURE ON THE FRACTURE TOUGHNESS OF HIGH STRENGTH STEELS
David P. Kendall Jul. 1970 36 p refs
(AD-713357; WVT-7044) Avail: NTIS CSCL 11/6

The effect of loading rates, ranging from 10 to 100,000 ksi square root of (in/sec), and temperatures, ranging from room temperature to –100F, on the plane strain fracture toughness of several high strength alloy steels has been determined. Materials investigated are a commercial 4340 steel, a modified 4330 steel from a gun tube forging having three different heat treatments and two different heats of 250 grade maraging steel. Test specimens utilized are essentially ASTM compact tension type specimens of one inch thickness. Tests were conducted on an open loop, hydraulic, high loading rate tensile testing machine. Results are presented in the form of graphs of fracture toughness versus temperature for the maximum and minimum loading rates (dynamic and static). Fracture toughness versus loading rate at –60F and yield strength versus elastic strain rate at room temperature, –60F and –100F for one heat of maraging steel are also reported. Author (TAB)

N71-14536# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THERMODYNAMICS OF THE CORROSION INHIBITION OF IPON IN THE Fe/H2O, H2O2, O2 SYSTEMS
Z. Pavlovich et al 13 Aug. 1970 11 p refs Transl. into ENGLISH from Tr. Mexhdunarodnogo Kongressa Korrozii Metallov 3d 1966 (USSR), v. 2, 1968 p 106–110
(AD-713451; FTD-HT-23-346-79) Avail: NTIS CSCL 11/6

The thermodynamic criterion Pi of the course of the electrode reactions in the water, hydrogen peroxide, and iron/water, oxygen systems were determined. Pi equals a given formula, where A is the chemical affinity and U the polarization in the presence of absorbed H and the c and e subscripts refere to the cathodic and anodic reactions, respectively. The Pi is given in volt times kcal. The I - pH diagrams for o these systems were obtained. The products of Fe corrosion that are most likely are given. The developed method of thermodynamic allows for discriminating between the inhibitive actions of oxygen and hydrogen peroxide. TAB

N71-14541# British Steel Corp., London (England).
IDENTIFICATION OF EMBRITTLING PHASE IN ZIRCONIUM STEELS
J. M. Arrowsmith [1970] 7 p refs
(SNW(C)/E.7/21) Avail: NTIS

Electron microscopy, electron diffraction, and electron probe microanalysis were used to identify the phase which embrittles vacuum casts of steel containing a Zr level of 0.1% or more. Sheets of ZrC and Zr4C2S2 were identified as the embrittling agents. The carbo-sulfide phase has a hexagonal crystal structure with parameters determined by electron diffraction a = 3.45A, c = 12.4A, C/a = 3.60. Author

N71-14611# Advisory Group for Aerospace Research and Development, Paris (France).
STANDARDIZATION OF TEST METHODS FOR STRESS-CORROSION CRACKING
D. E. Piper (Boeing Co., Seattle) Dec. 1970 9 p
(AGARD-AR-25-70) Avail: NTIS

A synopsis is reported of the survey which was carried out in Norway, The Netherlands, Belgium, France, Italy, Germany, the UK and North America. The survey revealed that several organizations in Europe and North America were either examining the feasibility of standardizing test techniques or actually conducting comparative testing programs at different laboratories. It was generally agreed by the sources visited that a standardization of test methods for stress-corrosion cracking would be extremely useful provided that the standardized methods yielded data that are reproducesble, discriminative and interpretable from an engineering and scientific viewpoint. Author

N71-14678# British Steel Corp., London (England). Metallurgy Div.
AN INVESTIGATION INTO INTERELEMENT EFFECTS IN THE DIRECT-READING SPECTROMETRIC ANALYSIS OF STEELMAKING SLAGS USING PELLET TECHNIQUES
W. Johnson 1968 22 p Supersedes MG/DB/526/67
(MG/D/513/68) Avail: NTIS

Pellets made from a standardized slag remelted with 20% of each of its constituents were used to compare three pelletizing techniques on both an air-path instrument and a vacuum path instrument. In addition, the material was analyzed by the rotrode solution technique on the air-path instrument. Using the mean level of each constituent found and its associated coefficient of variation as a guide to the magnitude of interelement interference due to changes in composition of the order of 20%, it is clear that: (1) the excitation of the vacuum instrument is much superior to the air-path instrument for pellets, (2) the level of interference drops with increasing dilution, and (3) prefusion of the slag and flux reduces the scatter in the totals obtained. If only an air-path instrument is available, then the rotrode solution technique is superior to any of the pellet techniques tried. Author

N71-14688# Oak Ridge National Lab., Tenn.
TECHNICAL PAPERS OF THE 23d METALLOGRAPHIC GROUP MEETING
R. J. Gray, comp. 1969 243 p refs Conf. held at San Francisco, 11–12 Sep. 1969 Sponsored by AEC
(CONF-690954) Avail: NTIS

The deep field microscope enabling the photography of specimens of varying size and unusual shape is described. A technique was developed for electrolytically polishing homogenized delta phase plutonium. Explosive bonding and compacting processes were used with success to join similar and dissimilar metals classified as incompatible when fusion or diffusion joining methods are used. Metallographic and fractographic analysis of stainless steel specimens were studied after low cycle fatigue testing. Tritium segregation in stainless steel was studied using autoradiographic techniques. Elevated temperature metallographic techniques were developed to determine the grain size of beta plutonium. Hot cracking in weldments of Haynes alloy no. 25, transmutation-produced silicon in a neutron irradiated aluminum alloy, uranium-plutonium fuel materials, and Cr23C6 modified (U, Pu)C fuels were also investigated. J.A.M.

N71-14689# Maryland Univ., College Park. Engineering Materials Group.
TOTAL MATERIAL VARIABLES INFLUENCING A DUCTILE-BRITTLE TRANSITION TEMPERATURE FOR MOLYBDENUM
E. Pink and R. W. Armstrong Sep. 1970 22 p refs
(Contract N00014-67-A-0239-0011)
(AD-713191; TR-1) Avail: NTIS CSCL 11/6

The ductile-brittle transition temperature for a coarse grained re-crystallized molybdenum material was found to be lower than for the original fine grained metal from which it was produced. The coarse grain size resulted from a critical straining and subsequent annealing treatment at a low recrystallization temperature. It is concluded from an analysis of various strength parameters which are either measured or estimated for this material that an improved grain boundary strength and a considerable influence of the dislocation substructure are responsible for the less brittle behavior of the coarse grained molybdenum. Author (TAB)

N71-14762# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THEORY AND PRACTICE OF THE PRODUCTION OF FIBER MATERIALS
I. M. Kopev et al 9 Sep. 1970 16 p ref Transl. into ENGLISH of THE BOOK "Poroshkovaya Metallurgiya v Novoi Tekhnike. Sbornik" Moscow, Nauka, 1968 p 5–13
(AD-713668; FTD-HT-23-530-70) Avail: NTIS CSCL 11/6

The authors explain the main stages in the development of fiber metallurgy abroad, describe a method of producing fiber materials, and discuss the principles of developing composite materials based on metal fibers with specific physical properties. Data on materials based on filamentary crystals (whiskers) are presented and a brief review of Soviet experimental work in the field of fiber metallurgy is given. The applications of fiber materials are discussed. Author (TAB)

N71-14763# National Science Foundation, Washington, D.C.
RHENIUM ALLOYS
E. M. Savitskii et al 1970 367 p refs Transl. into ENGLISH of the book "Splavy Reniya" Moscow, Izdatelstvo Nauka, 1965 331 p
(TT-69-55081) Avail: NTIS CSCL 11F

Contents: Rhenium sources and technology; Production and properties of metallic rhenium; Phase diagrams of rhenium. USGRDR

N71-14764# National Science Foundation, Washington, D.C.
STUDY OF DIFFUSION OF SULFUR IN NICKEL [ISSLEDOVANIE DIFFUZII SERY V NIKEL]
A. A. Presnyakov et al 1970 11 p ref Transl. into ENGLISH from Tsvetn. Metal. (USSR), v. 30, no. 2, 1957 p 73–76
(TT-70-57011) Avail: NTIS CSCL 11F

The rate of diffusion of sulfur in nickel depends on temperature. Noticeable diffusion of sulfur starts from a temperature of 500 C. The rate of diffusion of sulfur in nickel is reduced with an increase in the degree of initial deformation. Author (USGRDR)

N71-14823# Aerojet-General Corp., Sacramento, Calif. Materials Research Lab.
PHASE EQUILIBRIA INVESTIGATION OF BINARY, TERNARY, AND HIGHER ORDER SYSTEMS. PART 1: THE PHASE DIAGRAMS OF THE SYSTEMS Ti-Nb-C, Ti-Ta-C, AND Ti-Mo-C
E. Rudy Aug. 1970 148 p refs
(Contract F33615-67-C-1513)
(AD-713153; AFML-TR-69-117-Pt-1) Avail: NTIS CSCL 11/6

The ternary alloy systems Ti-Nb-C, Ti-Ta-C, and Ti-Mo-C were investigated by means of X-ray, melting point, DTA, and metallographic techniques and phase diagrams for all three systems from 1500C through the melting range were established. The solid state phase relationships in all three systems are similar. The cubic monocarbides are completely miscible, whereas the subcarbides, Nb(Ta,Mo)C2 show limited solubility and are terminated by three-phase equilibria Me + Me2C + MeC1 x in the ternary. The sublattice order-disorder transition in the subcarbides is lowered by titanium substitutions. The monocarbide solutions in all three systems show a regular melting behavior. The phase relationships of the three systems are discussed and the differences in particular equilibria are related to the thermodynamic properties of the phases in the boundary systems. Author (TAB)

N71-14857# Aerojet-General Corp., Sacramento, Calif. Materials Research Lab.
EXPERIMENTAL PHASE EQUILIBRIA OF SELECTED BINARY, TERNARY, AND HIGHER ORDER SYSTEMS. PART 5: THE PHASE DIAGRAM W-B-C Technical Report, Apr. 1967–May 1969
E. Rudy Aug. 1970 62 p refs
(Contract F33615-67-C-1513)
(AD-713154; AFML-TR-69-117-Pt-5) Avail: NTIS CSCL 11/6

The ternary alloy system W-B-C was investigated experimentally by means of X-ray, melting point, DTA, and metallographic techniques on hot pressed and heat treated, as well as melted specimens, and a phase diagram from 1500C through the melting range established. No ternary phases are formed in the system and the mutual solubilities between carbide and boride phases are small. The solid state sections (<2000C) are characterized by two-phase equilibria existing between the phase pairs W2B + W2C, W2B + WC, WC + WB, WB + C, W2B5 + C, W2B5 + B4C, and WB approximately 4 + B4C. The two-phase equilibrium W2B + WC is replaced by an equilibrium W2C + WB above 2150C. Fifteen ternary isothermal reactions were found. Five are associated with pseudobinary eutectic equilibria, six with ternary eutectics, and the remaining four with class II ternary four-phase reaction isotherms. Author (TAB)

N71-14858# Aerojet-General Corp., Sacramento, Calif. Materials Research Lab.
EXPERIMENTAL PHASE EQUILIBRIA OF SELECTED BINARY, TERNARY, AND HIGHER ORDER SYSTEMS. PART 7: THE PHASE DIAGRAM Ti-V-C Technical Report, Apr. 1967–May 1969
Edwin Rudy Aug. 1970 75 p refs
(Contract F33615-67-C-1513)
(AD-713150; AFML-TR-69-117-Pt-7) Avail: NTIS CSCL 11/6

The phase relationships in the Ti-V-C system were experimentally investigated by means of X-ray, melting point, DTA, and metallographic methods on heat-treated and melted specimens, and a phase from 1400C through the melting range established. The solid state equilibria are characterized by the monocarbide 2phases, and a limited Ti-exchange in V2C (15 At. % at 1400C); a wide two-phase equilibrium is formed between the carbon-deficient monocarbide solid solution and the metal phase. The V2C-solid solution is terminated by a three-phase equilibrium, V2C + (V,Ti)C1-x + (V,Ti)-ss, in the ternary. Four isothermal reactions occur in the system, of which three correspond to pseudobinary eutectic reactions, and the fourth to a ternary eutectic between metal, subcarbide, and monocarbide. The monocarbide solid solution has a minimum melting point of 2625C at a composition Ti-V-C (6-50-44 At.%). Author (TAB)

N71-15023# Bhabha Atomic Research Centre, Bombay (India). Spectroscopy Div.
SPECTROGRAPHIC ANALYSIS OF PURE BISMUTH
T. R. Saranathan and K. Harihara Ayyar 1970 8 p refs

(BARC-486) Avail: AEC Depository Libraries

A spectrographic method is described for the analysis of bismuth oxide and metal for a number of impurities. The powdered sample is mixed with graphite in the ratio 5:1 by weight and 25 mg of the charge is arced at 10 amps dc. The spectra are photographed using the Ebert 3.4-meter grating spectrograph with a 15,000 lpi grating set in the second order for 2250 A to 3500 A region. Chromium, incorporated in the graphite, is used as the internal standard. The detection limit ranges between 0.1 and 10 ppM for various elements and the precision of the method is about + or − 20%. Author (NSA)

N71-15024# Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.

SODIUM TECHNOLOGY PROGRAM Quarterly Progress Report, Period Ending 30 Jun. 1970

William E. Ray Aug. 1970 46 p refs

(Contract AT(30-1)-4173)

(WARD-4173-2) Avail: NTIS

Research results are summarized for work in interstitial carbon and nitrogen transport by sodium in stainless steel and on sodium corrosion of weldments and brazements. Results are also reported on evaluations of mechanical properties of structural materials in sodium. NSA

N71-15025# Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.

SODIUM TECHNOLOGY PROGRAM Quarterly Progress Report, Period Ending 31 Mar. 1970

William E. Ray May 1970 87 p refs

(Contract AT(30-1)-4173)

(WARD-4173-1) Avail: NTIS

A detailed experimental program was written for the carbon equilibrium loops (CELs) covering shakedown of the loops and metering systems, carbon meter calibration, and evaluation of C sub e and M values. A study of methods for hydrogen control was made. Cover gas stripping was compared with cold trapping, and allowances were made for loss of hydrogen by permeation through the loop walls. The effects of sodium on brazed Inconel 718 fuel pin grid type samples are investigated. Results of weight change and metallography investigations have indicated that at 1200 F, Inconel 718 loses weight due to loss of nickel and chromium; and Nicrobraz 50 loses nickel and phosphorus when exposed to flowing, low oxygen sodium. The sodium preexposure loop (PEL-1) operation was terminated after 5049 hours with mechanical property type test samples of Type 316 stainless steel at 1200 and 1325 F. Checkout operations of the stress-relaxation and creep-rupture systems with flowing sodium and a test sample at 1200 F were performed. Author (NSA)

N71-15036# Bhabha Atomic Research Centre, Bombay (India).

INTERNAL FRICTION DUE TO OXYGEN-SUBSTITUTIONAL IMPURITY ATOM COMPLEXES IN ZIRCONIUM

S. Mishra and M. K. Asundi 1970 24 p refs Presented at the 23d meeting of the Indian Inst. of Metals, Bombay

(BARC-458; CONF-691128-1) Avail: AEC Depository Libraries

The effects of W, Fe, and Si in combinations with O as impurities on internal friction in Zr were investigated. Data are presented tabularly and discussed. It was found that W and O are both required for the appearance of an internal friction peak. Iron−O complexes also give rise to internal friction peaks as do Si−O complexes. NSA

N71-15037# Los Alamos Scientific Lab., N.Mex.

ON THE DIFFUSION MECHANISM IN TRANSITION-METAL MONOCARBIDES

V. N. Zegriazki Jul. 1970 9 p refs Transl. into ENGLISH from Fiz. Metal. Metalloved. (Sverdlorsk), v. 28, 1969 p 292−297 Sponsored by AEC

(LA-tr-70-20) Avail: NTIS

The possible mechanisms for atom diffusion in monocarbides of titanium, zirconium, hafnium, vanadium, niobium, and tantalum were studied. It was assumed that the diffusion transition of carbon atoms takes place by using vacancies in the metallic sublattice at 2000 to 3000 C. This assumption was used to calculate the parameters of self-diffusion of metallic atoms in the monocarbides of the transition metals. Author (NSA)

N71-15062# California Univ., Livermore. Lawrence Radiation Lab.

LEAD

A. H. Du Rose and William Blum 21 Jul. 1970 20 p refs Submitted for publication Sponsored by AEC Revised

(UCRL-50895) Avail: NTIS

The principles, as well as operating conditions and characteristics, of the electrodeposition of lead from fluoborate, fluosilicate, and sulfamate baths are discussed. Lead−tin alloy plating, the use of lead for anodes, mechanical properties of lead and lead alloys, and the stripping of lead and lead−tin deposits are also discussed. NSA

N71-15060# Forsvarets Forskningsanstalt, Stockholm (Sweden).

SOME HIGH-PRESSURE PROPERTIES OF URANIUM AND OTHER ACTINIDES [NAGRA HOEGTRYCKSEGENSKAPER HOS URAN OCH ANDRA AKTINIDER]

G. Lemon Jul. 1970 48 p refs in SWEDISH

(FOA-4-C-4434-23) Avail: AEC Depository Libraries

A high-pressure-cell was modified for accurate determination of electrical resistance and pressure. The equipment used has three separate electrical circuits. It was designed for measurement of the resistance of uranium up to about 600 kbars. Any changes in electrical resistance from phase conversion at 500 kbars, as proposed from shock wave experiments, were not observed. Compression data for uranium from different experiments are discussed and analyzed. From the variation in the periodic system of some volume-dependent quantities, values for the heavy elements are suggested. Author (NSA)

N71-15061# Bureau of Mines, Reno, Nev. Metallurgy Research Center.

A COMPARISON OF SUBLIMATION AND VAPORIZATION FOR PURIFICATION OF SAMARIUM METAL

J. E. Murphy, E. Morrice, and M. M. Wong Dec. 1970 15 p refs

(BM-RI-7466) Avail: Issuing Activity

Purification of samarium metal by sublimation and by vaporization from a low-melting metal flux, at the same temperature, is considered. Vaporization proved more effective for removing impurities such as magnesium, calcium, and manganese. Recovery of samarium is shown to be more rapid by sublimation because of its constant rate of distillation. Author

N71-15065# Iowa State Univ. of Science and Technology, Ames.

LOW-TEMPERATURE SPECIFIC HEAT OF CERIUM AND CERIUM-YTTRIUM ALLOYS

Nicholas Theodore Panousis (Ph.D. Thesis) Sep. 1970 82 p refs

(Contract W-7405-eng-82)

(IS-T-398) Avail: NTIS

The low temperature specific heat of alpha-cerium free from other allotropic modifications has been measured for the first time at standard pressures. The low temperature specific heats of a nearly pure beta-cerium sample (91% beta−9% alpha) and six beta-stabilized Ce−Y alloys were also determined between 2.5 and 20 K. It was found that all six alloys showed magnetic ordering characteristic of beta-cerium; the ordering temperatures were found to be linearly dependent on the cerium concentration. The

magnetic specific heat of beta-cerium was found to depend on the cube of the absolute temperature in agreement with the prediction of spin wave theory for an antiferromagnetic material. The entropy associated with the magnetic ordering was found to be R ln 2, which was explained in terms of hexagonal crystal field splitting. The two excited doublets resulting from the hexagonal crystal field were estimated to be 85 + or − 5 and 110 + or − 10 K above the ground state. Author (NSA)

N71-15067# Naval Research Lab., Washington, D.C.
REPORT OF NRL PROGRESS
Nov. 1970 64 p refs
Avail: NTIS

Analysis of grain boundary groove shape was used to determine solid-liquid interfacial free energies. Experimental separation and identification of acoustic normal modes in shallow water was obtained and acoustic radiation impedance of caps and rings on oblate spheroidal baffles was analyzed by using an eigenfunction expansion in oblate spheroidal wave functions. Attitude sensors were used to determine the motion of a free rotator. Measurements have been made of static electric loads developed during refueler loading and capacities of molecular sieves in hostile environments were evaluated. Work in communications considered Doppler shift communications systems, millimeter wave propagation, detonation wave effects on radio waves, and complex ray configurations in the ionosphere. A computational manual for meromorphic functions with values distributed almost on one line is outlined. Metallurgical work centered on mechanical and electrical properties of metals and plastics. Ocean sciences and technologies studies considered magnetic fields, biological media, engine fatigue, and underwater photography. The display of digital radar data and properties of radar sea echoes as well as the conversion of a manually operated antenna to an autotracking antenna system were also considered. G.G.

N71-15068# Defence Standards Labs., Maribyrnong (Australia).
THE STRUCTURE OF HIGH-PURITY COPPER INGOTS NUCLEATED AT LARGE UNDERCOOLINGS
B. L. Jones and G. M. Weston Jun. 1970 15 p refs
(Rept-374) Avail: NTIS

The structures observed in small ingots of high purity copper, nucleated at temperatures far below the melting point, have been studied. In contrast to other metals, no general recrystallisation is observed in high purity copper even after nucleation 200 C below the melting temperature. The reasons for this are discussed and it is suggested that a dendrite arm re-melting process is a pre-requisite for general recrystallisation. This requires a higher impurity content than the present copper ingots contained. Annealing treatments failed to produce a decrease in grain size despite the highly dislocated structure produced during freezing. The observed mechanisms of grain boundary migration are discussed in terms of a recent theory by Gleiter, and confirm earlier evidence that many of the grains nucleated originally are in mutual twin orientation. Author

N71-15097# Bhabha Atomic Research Centre, Bombay (India). Metallurgy Div.
CURRENT TRENDS ON AQUEOUS CORROSION OF ZIRCONIUM ALLOYS: A Review
H. S. Gadiyar 1970 25 p refs
(BARC-463) Avail: AEC Depository Libraries

Zirconium and its alloys have found broad based application in pressurized and boiling water reactors for fuel cladding or for structural materials. When these alloys are considered, emphasis is laid not only on initial mechanical and physical properties, but also on the effects of corrosive attack, radiation damage, and hydriding. The development of zirconium alloys from considerations of corrosion in water and steam, mechanisms of film growth in this medium, effect of heat-treatment on these alloys, hydrogen absorption during corrosion, and behavior under irradiated conditions is reviewed. The recent trends in the development of the alloys for use in both water- and steam-cooled reactors have also been included. Author (NSA)

N71-15100# Bhabha Atomic Research Centre, Bombay, (India). Metallurgy Div.
PRECIPITATION KINETICS OF ZIRCONIUM HYDRIDES IN ZIRCONIUM
K. S. Sivaramakrishnan 1969 17 p refs Presented at the 23d Meeting of the Indian Inst. of Metals, Bombay, Nov. 1969
(BARC-448; Conf-691128-2) Avail: AEC Depository Libraries

Hydrogen embrittlement in zirconium-base alloys is known to occur due to formation of zirconium hydride precipitates. As zirconium base alloys find considerable application in nuclear technology, a study of the nucleation and growth kinetics of zirconium hydrides is of great interest. The precipitation kinetics of zirconium hydride when sponge zirconium containing 200 ppM hydrogen is solution treated and later annealed at 220 to 350 C is described. Results indicate that the heterogeneous reaction involving nucleation and growth of the hydride phase in sponge zirconium is by the Johnson-Mehl equation, the value of time exponent component being 1.44. The temperature dependence of the reaction rate constant gives an activation energy of 7.3 kcal/g-mole which compares favorably with diffusion activation energy of hydrogen in zirconium. The precipitation of hydrides is therefore believed to be diffusion controlled at 200 to 350 C. Author (NSA)

N71-15101# South Carolina Univ., Columbia. Coll. of Engineering.
POWDER METALLURGY COMPACTION Quarterly Progress Report, 1 Jun. −31 Aug. 1970
E. G. Schwartz, Kenneth L. Wilson, and James B. Hornsby 31 Aug. 1970 16 p refs
(Contract AT(38-1)-475)
(SRO-475-8) Avail: NTIS

Research results indicate that compacts vibrated during manufacture are more dense than compacts made under static conditions. This observation was made at compacting pressures producing compacts of approximately 75% theoretical density (95% theoretical density compacts hid the effects of superimposed vibrations). Segregation of powder during vibration does not appear to be of concern. Powdered lead in a matrix of aluminum showed no tendency to segregate provided the compact was loaded slightly before energizing the vibrating mechanism. Slow oscillations of a die during compaction (20, 30, and 40 cpm) failed to produce a noticeable reduction in die wall friction. This result could be due to the slow frequencies used or perhaps even the method of interpreting data. Further work is planned in this area. Author (NSA)

N71-15102# Purdue Univ., Lafayette, Ind. School of Materials Science and Metallurgical Engineering.
TRANSPORT AND THERMODYNAMIC PROPERTIES OF SOLIDS Technical Progress Report, 1 Sep. 1969 −31 Aug. 1970
Richard E. Grace 1 Sep. 1970 28 p
(Contract AT(11-1)-1436)
(COO-1436-28) Avail: NTIS

Research directed to kinetics of ternary diffusion in Ag−Zn−Cd and in Cu−Zn−Ni is summarized. Research on electrical properties and diffusion of point defects in calcium tungstate CaWo4, and diffusion-limited sulfidation reactions in the Fe−O−S and Mn−O−S systems is also reported. NSA

N71-15103# Atomics International, Canoga Park, Calif. Liquid Metal Engineering Center.
LIQUID METAL ENGINEERING CENTER (LMEC) Semiannual Technical Progress Report, January −June 1970
10 Sep. 1970 201 p refs

(Contract AT(04-3)-700)
(LMEC-70-13) Avail: NTIS

Wastage data for 2.25 Cr-1 Mo ferritic steel obtained in APDA Rig 10 tests were analyzed. The computer simulation of a flashing water jet was extended from the one-dimensional model to a two-dimensional planar-jet model. This permits the calculation of jet parameters in terms of axial distance from the choke plane. Alco/BLH steam generator boiling phenomena tests were continued until development of additional tube leaks. Data obtained from screening tests of a large number of candidate materials in static and unidirectional sliding contact with sodium vapor or liquid were analyzed and summarized. The diagnostic test program on the steam generator and intermediate heat exchanger was performed. Preliminary evaluation of test data indicates large variations in levels of heat transfer performance. An evaluation was performed to determine an improved stabilization procedure for the Microdot SG420 strain gages. Significant changes in the apparent strain characteristics of the gage were noted during thermal soak tests at 900 F after 500 and 860 hr. NSA

N71-15173# Royal Aircraft Establishment, Farnborough (England).
FATIGUE TESTS ON TITANIUM [DAUERSCHWINGVERSUCHE AN TITAN]
D. Haffer et al. Sep. 1970 31 p refs Transl. into ENGLISH from Materialpruefung (Duesseldorf), v. 3, no. 1, 1961 p 5-14
(RAE-Lib-Trans-1493) Avail: NTIS

Direct stress and rotating bending tests on round test pieces of annealed and cold worked pure titanium were carried out. The results are presented in 59 Woehler curves. Fatigue tests were performed on unnotched test pieces and on test pieces with different notch radii at temperatures of 20 and 300 C. Comparison with tensile results showed that some fatigue tests were carried out at stresses above the 0.2 per cent yield point. The notch sensitivity of titanium is compared to that of other materials by means of the shape factor, the fatigue notch factor, the shape factor/fatigue notch factor ratio, and the relative stress gradient. It is concluded that the notch sensitivity of the titanium examined is approximately equal to that of steel of the same strength. Author

N71-15190# Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant.
ANOMALOUS MECHANICAL PROPERTIES OF URANIUM-7.5 WEIGHT PERCENT NIOBIUM-2.5 WEIGHT PERCENT ZIRCONIUM ALLOY
R. E. Oakes, Jr. 22 Sep. 1970 36 p refs
(Contract W-7405-eng-26)
(Y-1732) Avail: NTIS

Abnormal mechanical properties in uranium-7.5 wt. % niobium-2.5 wt. % zirconium alloy, such as nonlinear elasticity, rubber-like amounts of elastic spring back, and large amounts of mechanical hysteresis were examined in uniaxial tension and compression with respect to stress, strain, and aging. The results of these mechanical tests indicate the occurrence of a stress-induced phase transformation in both the sequenched and aged alloy. Volumetric, resistance, and microstructural changes which occur under stress in the alloy further substantiate the occurrence of such transformation. Author (NSA)

N71-15200*# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.
DETERMINATION OF WELDABILITY AND ELEVATED TEMPERATURES STABILITY OF REFRACTORY METAL ALLOYS. 4: POST WELD ANNEALING STUDIES OF T-3
G. G. Lessmann Washington NASA Dec. 1970 67 p refs
(Contract NAS3-2540)
(NASA-CR-1610; WAN-PR-(P)-016) Avail: NTIS CSCL 13H

The weld structure of T-111 shows some aging effects (over the range 1500 to 2400 F) even after aging at 2400 to 3000 F for 1 hour. The aging was followed by the bend DBTT (ductile-to-brittle-transition temperature) test and study of the microstructure. No post weld annealing cycle totally eliminated the aging effect. A mechanism to explain the complicated observed aging phenomenon is postulated. The loss of ductility observed does not result in welds which cannot be used because of low ductility. (Tensile ductility is < 23 percent.) It is concluded that 2400 F (1316 C) for 1 hour is a satisfactory post weld anneal temperature. Author

N71-15213# Army Missile Command, Redstone Arsenal, Ala. Physical Sciences Lab.
ECHO AMPLIFICATION IN MAGNETIC MATERIALS WITH APPLICATION TO PULSE COMPRESSION RADAR
A. C. Daniel, B. D. Guenther, and C. R. Christensen 1970 15 p refs
(AD-713518) Avail: NTIS CSCL 20/3

Echo phenomena in several materials have been reviewed for the purpose of considering the recently proposed amplified spin echo as a chirp radar receiver. The technique is believed to exhibit considerable merit in that a number of desirable characteristics have been combined in a unique manner. If properly realized, a portion of the processing of the radar signal could be accomplished at the antenna feed element. However, the available materials still limit the practical usefulness of this device as compared to more conventional techniques. Author (TAB)

N71-15214# Air Force Systems Command, Wright-Patterson AFB, Ohio. Materials Lab.
GENERAL ALLOY ANALYSIS WITH A GAS SHEATHED TUBULAR ELECTRODE ARC Technical Report, Mar. 1969 - Mar. 1970.
James H. Muntz Aug. 1970 31 p refs
(AD-713890; AFML-TR-70-117) Avail: NTIS CSCL 11/8

The gas sheathed tubular electrode arc has been investigated and applied to general alloy analysis. One set of six solution standards containing 18 different elements was used. Matrix effects have been mostly controlled by using a 1mg/ml sample or standard in a solution containing 6mg/ml of sodium as the chloride. Fourteen different standard alloys (NBS and Alcoa) were tested, representing seven different base metals. The overall accuracy was only about plus or minus 8% deviation from the certified value. This would permit identification of alloy type, but for greater accuracy standards more closely approximating the sample should be used. Precision for the technique is normally plus or minus 3 to 4% relative standard deviation with photographic detection. Author (TAB)

N71-15226# California Univ., Livermore. Lawrence Radiation Lab.
CALCULATION OF ELASTIC-VISCOUS-PLASTIC EFFECTS IN MATERIALS
M. L. Wilkins 20 Aug. 1970 17 p refs Presented at 17th Sagamore Army Materials Res. Conf., Raquette Lake, N.Y., 1-4 Sep. 1970 Sponsored by AEC
(UCRL-72639; Conf-700910-2) Avail: NTIS

A method is described that permits constitutive equations to be introduced easily into computer programs that solve the equations of continuum mechanics. The mathematical formulation provides for a wide range of viscous-elastic-plastic properties in materials. An example is given for a material described by a Maxwell solid. Author

N71-15231# California Inst. of Tech., Pasadena. W. M. Keck Lab. of Engineering Materials.
KONDO EFFECT IN ARMORPHOUS Fe-P-B-Si AND Co-P-B-Si ALLOYS
Ryusuke Hasegawa and C. C. Tsuei Sep. 1970 23 p refs
(Contract AT(04-3)-822)
(CALT-822-11; Rept-8) Avail: NTIS

A Kondo-type resistivity minimum was found in amorphous alloys obtained by rapid quenching from the liquid state and having the compositions Fe(x)Pd(80-x)Si20 and Co(x)Pd(80-x)Si20 in which x varies from 0 to 7 for Fe and from 0 to 11 for Co. Magnetic measurements indicate that these alloys become ferromagnetic at low temperatures. The resistivity and mangetoresistivity data are analyzed by the existing theories on the s-d exchange interaction. The results demonstrate that the coexistence of the resistivity minimum and ferromagnetism can be explained by the presence of small amounts of paramagnetic ions free from mutual interactions. This result is confirmed by magnetoresistivity measurements. The estimated value for the s-d exchange integral are -0.62 eV for the Fe-Pd-Si alloys and -0.42 eV for the Co-Pd-Si alloys.
Author (NSA)

N71-15267# Metaalinstituut TNO, The Hague (Netherlands).
EXAMINATION OF ALUMINUM PRESSURE CABLES PROTRUDING FROM F84 F AIRCRAFTS [ONDERZOEK VAN ALUMINIUM DRUKLEIDINGEN AFKOMSTIG VAN F84 F VLIEGTUIGEN]
G. P. C. Hazebroek and W. Hagg 12 Jun. 1970 6 p In DUTCH
(TDCK-55807; M 70-407) Avail: NTIS

Visual and microscopic examinations of crack formations in aluminum spoiler cable structures established the cause as fracture fatigue; cracklines were initiated by the presence of extrusion lines. Outward growing cracklines were also found in as yet unbroken cable structures. It was not possible to predict crackline growths into full cracks.
Transl. by G.G.

N71-15268# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EFFECT OF NUCLEAR IRRADIATION ON THE PROPERTIES OF ORDERED SOFT MAGNETIC ALLOYS
M. A. Artsishevskiy et al 20 Aug. 1970 10 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 14, no. 10, 1969 p 1737-1739
(AD-713447; FTD-HT-23-360-70) Avail: NTIS CSCL 18/8

The effect of neutron irradiation on the magnetic properties of ordered soft magnetic alloys up to a given dosage in a given range was studied. The development of the directed order is the basic reason for the change in the magnetic properties during irradiation with small doses. The influence of the isotropic order on the magnetic properties increases with the growth of the doses.
Author (TAB)

N71-15293# Army Foreign Science and Technology Center, Washington, D.C.
PECULIARITIES OF PRODUCING THERMALLY STRENGTHENED TITANIUM ALLOYS [OSOBENNOSIT PROIZVODSTVA TERMICHESKI UPROCHNYAYEMYKH TITANOVYKH SPLAVOV]
I. I. Kaganovich et al 22 Sep. 1970 17 p refs Transl. into ENGLISH from the publ 'Lightweight Alloys and Their Treatment Methods' Moscow, Izd-Vo, 1968 p 268-277
(AD-713760; FSTC-HT-23-243-70) Avail: NTIS CSCL 11/6

The heterogeneity of the structure of heat strengthened alloys increases their structural sensitivity. The usage of charge materials with the minimum quantity of alpha stabilizing impurities, improved conditions of vacuum arc melting of ingots under increased vacuum with lower leakage, the usage of heat and mechanical deformation regimes providing the required structure allow products to be produced from these alloys with high and stable mechanical properties.
Author (TAB)

N71-15330# Metaalinstituut TNO, The Hague, Netherlands.
STUDY ON THE CORROSION PREVENTION BEHAVIOR OF VCI PAPER. CONTINUATION OF THE REPORTS C-66-477, C-68-376, M-68-905 [ONDERZOEK VAN HET CORROSIEWEREND GEDRAG VAN VCI-PAPIER VERVOLG VAN DE RAPPORTEN C-66-477, C-68-376, M-68-905]
J. W. Boon 23 Sep. 1970 22 p In DUTCH
M 70-607; TDCK-56429) Avail: NTIS

Two different papers, Bran-O-Rost WL14 and Nox-Rost-WL14, were evaluated for their use as corrosion preventing wrapping materials for steels. Stretched paper samples were exposed to a controlled air flow of 50 percent moisture content at 50 C and their evaporation weight losses were determined at various intervals. It was found that both papers withstood for a long time; however, the Bran-O-Rost paper showed smaller weight loss during the first five to six days of long duration testing. Weight losses for the Nox-Rost paper were generally somewhat larger under equal experimental conditions in the drying oven.
Transl. by G.G.

N71-15331# Watervliet Arsenal, N.Y.
ANISOTROPY OF FATIGUE CRACK PROPOGATION IN HOT ROLLED BANDED STEEL PLATE
Francis A. Heiser 1970 15 p refs
(AD-713536) Avail: NTIS CSCL 11/6

The dependence of crack growth rate on stress intensity factor was found to be sensitive to the microstructural constituents, their orientation with respect to the fracture plane and direction, and the level of the stress intensity factor. The anisotropy of crack growth rate was found to be a function of the level of the stress intensity factor. Macroscopic growth rate could be considered to be the summation of several fracture mechanisms, the most important being striation formation and local fracture of brittle microconstituents, viz., inclusion-matrix fracture or cleavage. Striation spacing was seen to be independent of orientation suggesting that fracture of inclusions was responsible for the crack growth rate anisotropy. This indicated that steel cleanliness should be more important in low cycle fatigue applications. The dependence of crack growth rate on stress intensity factor decreased as the toughness of the base material increased. In general, those factors which contributed to high fracture energy also contributed to low fatigue crack growth rate, particularly at the higher values of K.
Author (TAB)

N71-15332# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INTERACTION OF HAFNIUM WITH CERTAIN TRANSITION METALS
V. N. Svechinkov et al 11 Aug. 1970 8 p Transl. into ENGLISH of the book "Diagrammy Sostoyaniya Metallicheskikh Sistem; Obzor Issledovanii" Moscow, Nauka, 1968 p 153-156
(AD-713778; FTD-HT-23-401-70) Avail: NTIS CSCL 11/6

Despite its high cost, hafnium has been gaining wider acceptance in modern technologies. Owing to its refractory properties combined with high solubility and its positive effect on heat resistance, hafnium has been used as a component of a number of new construction materials containing niobium, tantalum, molybdenum and tungsten. The paper analyzes the effect of hafnium on the properties of widely used alloys containing iron, nickel, copper, aluminum and presents phase diagrams of hafnium with manganese, iron, cobalt and nickel over the entire range of concentrations.
Author (TAB)

N71-15353# Army Missile Command, Redstone Arsenal, Ala.
RADAR POLARIZATION DIVERSITY EFFECTS ON TARGET RERADIATED PHASE FRONT
John L. Hatcher and Carlton H. Cash 1970 15 p refs
(AD-713535) Avail: NTIS CSCL 17/9

Polarization diversity as a technique to reduce the effects of target glint or angle fluctuation was investigated by means of a combined analytical and experimental program. The analytical portion of the program reported here was based on a simple

two-element target model from which the angular error in the reradiated phase front was computed. The results of these computations showed that, within the constraints of the model, polarization diversity could reduce the angular tracking errors. The experimental program used a pulse Doppler conical scan tracking radar with a polarization-agile antenna; field tests conducted with actual targets showed an improvement in target tracking ability with polarization diversity as compared to linear polarization, either horizontal or vertical. Continuing effort in the area includes more sophisticated target models and associated computer simulation to more accurately represent analytically the true target situation. In addition, investigations are proceeding to adapt the polarization diversity techniques to monopulse radars and conduct further experimental evaluation of its effectiveness to reduce phase front errors. Author (TAB)

N71-15367# Ohio State Univ. Research Foundation, Columbus. Dept. of Metallurgical Engineering.

EFFECT OF ALLOY COMPOSITION OF THE STRESS CORROSION CRACKING OF Fe-Cr-Ni BASE ALLOYS

J. J. Royuela, T. L. Raredon, E. Serrate, C. R. Morin, R. V. Farrar et al 9 Jan. 1970 109 p refs

(Contract AT(11-1)-1319)

(COO-1319-81) Avail: NTIS

The effect of alloying on the behavior of Fe-Cr-Ni base alloys in boiling $MgCl_2$ solutions was investigated. Alloys included commercial Fe-Cr-Ni alloys, ternary Fe-Cr-Ni alloys to 40% Cr, fourth-component alloys with specific alloy bases, and fourth-, fifth-, and sixth-component alloys. The primary experimental measurements were time-to-breaking of wire specimens. In addition, polarization, potential-time, current decay, constant-potential cracking, and metallographic studies were conducted. Alloys of very substantial improvement in resistance to cracking were found. The most effective alloy additions were found to be aluminum, beryllium, and carbon. Lowering chromium to the 10 to 15% range was also found to be very effective in preventing cracking. The results are discussed in terms of the slip-step dissolution model of stress corrosion cracking. Author (NSA)

N71-15371# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INCREASING THE LIFE OF PARTS BY SURFACE STRAIN HARDENING

V. F. Kucherenko 18 Aug. 1970 12 p refs Transl. into ENGLISH from Met. i Gornorudn. Prom., (USSR), no. 6, 1968 p 63-66

(AD-713454; FTD-MT-24-160-70) Avail: NTIS CSCL 13/8

Surface work hardening of C 0.38-0.50 percent steel makes it possible not only to raise the fatigue strength but also the wear resistance of parts operating in conditions of cyclic overloading and wear. The positive effect of surface cold work is particularly significant for friction with lubricant. MoS_2 applied to degreased surfaces by depressed rollers raises the wear resistance of steel parts and noticeably decreases the frictional wear in couples with bronze during friction in an oil environment. Author (TAB)

N71-15443# California Univ., Livermore. Lawrence Radiation Lab.

MOESSBAUER INVESTIGATION OF THE Au-Pd-Fe ALLOY SYSTEM

Terrence M. Quick (Ph.D. Thesis) Aug. 1970 109 p refs

(URCL-50918) Avail: NTIS

Alloys of gold, palladium, and iron were prepared as absorbers and investigated with the use of the Mossbauer effect. All alloys contained approximately 2.5 at.% Fe-57 with varying ratios of gold and palladium. The experimentally-determined parameters reflect the transition from the ferromagnetic ordering of the palladium-rich alloys to the complex magnetic ordering of the gold-rich alloys. In the neighborhood of 50 at.% Pd, the magnetic ordering temperature is lowest, the slope of the isomer shift changes almost discontinuously, the effective spin changes erratically, the linewidths of the hyperfine field-split spectra are at a maximum value, and the nuclear moment ratios are about 1.8. Since the changes occur near the composition at which the palladium d-band is thought to be filled, the observed effects are probably associated with filling of the d band. The effective spins of J = 2-3 which were determined for the palladium-rich alloys are much lower than the giant spins of about 13/2 found by others using paramagnetic susceptibility measurements in applied fields. Author

N71-15444# Purdue Univ., Lafayette, Ind. School of Materials Science and Metallurgical Engineering.

STEADY STATE DIFFUSION IN Cu-Zn-Mn ALLOYS

J. D. Whittenberger and M. A. Dayananda 1 Jul. 1970 38 p refs

(Contract AT(11-1)-1436)

(COO-1436-26) Avail: NTIS

Steady state substitutional diffusion was investigated in the copper-rich phase of the Cu-Zn-Mn system at 850 C with thin membranes of copper exposed to the vapors of zinc and manganese. For the four series of experiments studied, steady state concentration profiles that were invariant with time were established within four to six days. A simple mobility model was employed in the analysis of concentration profiles for the calculation of mobilities of zinc and manganese at various ternary compositions along the steady state composition paths. The isomobility lines of zinc and manganese generated from these calculations were consistent with the mobility data for the binary Cu-Zn and Cu-Mn systems. Author

N71-15468# Electro-Optical Systems, Inc., Pasadena, Calif.

METHOD OF PRODUCING REFRACTORY BODIES HAVING CONTROLLED POROSITY Patent

Hoyt H. Todd, inventor (to NASA) Issued 20 Oct. 1970 (Filed 9 Jun. 1967) 5 p Cl. 75-202; Int. Cl. C22c29/00 Sponsored by NASA

(NASA-Case-LEW-10393-1; US-Patent-3,535,110; US-Patent-Appl SN-644799) Avail: US Patent Office CSCL 11F

A method is described for producing inexpensive, stable, porous bodies out of metal powders. The bodies have a large surface area, and selected por size and concentration. The objects are formed by pressing a mixture of fine refractory metal powder such as tungsten and fine inert metal powder such as copper or boron nitride. The resulting compacted body is then heated to a temperature above the sintering temperature of the pressed compact and below the melting point of the inert additive. After about 2 hours, the body is heated above the melting temperature of the inert metal to evaporate the inert powder and sinter the refractory metal powder to the selected pore size. Possible applications are identified as high temperatures structures such as rocket nozzles, turbine blades, bearings, electrodes, and lamp filaments. N.E.N.

N71-15478 Rensselaer Polytechnic Inst., Troy, N.Y.

A STUDY OF SOLIDIFICATION MECHANISMS IN FUSION WELDS IN A NICKEL-IRON ALLOY

John Stephen Erickson (Ph.D. Thesis) 1969 99 p

Avail: Univ. Microfilms: HC $5.00/Microfilm $3.00 Order No. 70-2616

Fusion welds in a 49% nickel-iron alloy were studied to determine the influence of the thermal gradient in the solid and the growth velocity of the solid-liquid interface on the nature of the cellular and cellular dendritic growth modes formed during weld soldification. Toward this end, an experimental technique was developed for measuring the temperature distribution in the solid about the weld pool, which was solidifying under two-dimensional heat flow conditions. The direction in which cellular growth occurred was controlled by welding on a 49% nickel-iron alloy which

exhibited a <100> preferred orientation in the rolling direction in the plane of the sheet. By preorienting the test specimens prior to welding, it was possible to control the direction in which the cellular substructure grew relative to the solid-liquid interface. It was found that the temperature in a direction perpendicular to the trailing edge of the weld pool decreased in an exponential manner with distance from the solid-liquid interface. The thermal gradient in the solid continuously decreased from the fusion line toward the weld centerline at the trailing edge of the weld pool. Dissert. Abstr.

N71-15538# Rensselaer Polytechnic Inst., Troy, N.Y.
ANISOTROPIC DIFFUSION AND ELECTROMIGRATION Annual Report
H. B. Huntington Aug. 1970 8 p refs
(Contract AT(30-1)-1044)
(RPI-1044-24) Avail: NTIS

Electromigration investigations reviewed include findings on anisotropy, interstitials, and bubble and void formation. Diffusion measurements in cadmium and tin are mentioned as well as theoretical modeling and transport theory studies. E.C.

N71-15547# Sandia Corp., Albuquerque, N.Mex. Library Reference Div.
MARTENSITIC CONVERSION IN Fe-Ni-Co ALLOYS [MARTENSITNOE PREVRASCHENIE v SPLAVAKH Fe-Ni-Co]
D. A. Mirzaev et al 25 Sep. 1970 14 p refs Transl. into ENGLISH from Fiz. Metal. i Metalloved. (USSR) v. 28, no. 2, 1969 p 362-368
(SC-T-70-4036) Avail: NTIS

Magnetic and thermographic methods were used to investigate the influence exerted by cobalt on the temperatures of M sub s, A sub s, T sub o and the thermal effect of gamma yields alpha on the conversion in iron alloys containing 15 atomic percent Ni. It was shown that thermodynamic calculations, based on the theory of regular solutions yield results which conform well to the experimental findings. Author

N71-15644* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH TEMPERATURE COBALT-BASE ALLOY Patent
John C. Freche, Stanley J. Klima, and Richard L. Ashbrook, inventors (to NASA) Issued 6 Sep. 1966 (Filed 26 Mar. 1964) 3 p Cl. 75-170
(NASA-Case-XLE-00726; US-Patent-3,271,140; US-Patent-Appl-SN-355126) Avail: US Patent Office CSCL 11F

Alloy compositions are described for aerospace structures which have liquid metals on one surface and a high vacuum on the other at temperatures up to 1850 F. The preferred composition contains 73.1% Co, 25.0% W, 1.0% Ti, 0.5% Zr, and 0.4% C; another composition has 73.6% Co and no Zr. The casting technique is described, and the resulting stress and rupture data are compared with data on some of the strongest commercially available cobalt based alloys. N.E.N.

N71-15645# Skoda Works, Pilsen (Czechoslovakia). Nuclear Power Plants Div.
Al-Mg-Si ALLOY AS A STRUCTURAL MATERIAL FOR HEAVY-WATER TANK OF THE FIRST CZECHOSLOVAK NUCLEAR POWER PLANT
P. Jicinsky 1970 20 p refs
(ZJE-86) Avail: AEC Depository Libraries

The main characteristics of this material and weld-joints are mentioned. Mechanical properties of this alloy are discussed. Author (NSA)

N71-15654# Bureau of Mines, Salt Lake City, Utah. Metallurgy Research Center.
METALLURGICAL APPLICATION OF SOLVENT EXTRACTION. 2: PRACTICE AND TRENDS
Joe B. Rosenbaum, D. R. George, and Joan T. May Jan. 1971 22 p refs
(BM-IC-8502) Avail: Issuing Activity

Applications and concepts of solvent extraction as a unit operation in extractive metallurgy are assessed. Wider use is being made of established solvent extraction techniques in processing spent nuclear fuel elements and in twinning columbium-tantalum, hafnium-zirconium, thorium, tungsten, uranium, and vanadium. Commercial application has been extended to recovery of beryllium, boron, bromine, copper, molybdenum, phosphorus, rare-earth metals, and rhenium. Systems in use and proposed typically extract metals or salts as anion, cation, or neutral species from aqueous media by reaction with a recycleable organic reagent. Author

N71-15655# Virginia Univ., Charlottesville. Dept. of Physics.
DISLOCATION ARRAYS: A THEORETICAL INVESTIGATION
Jon Thomas Moore (Ph.D. Thesis) Aug. 1970 154 p refs
(Contract AT(40-1)-3108)
(ORO-3108-102) Avail: NTIS

Two critical aspects of the two major theories of work-hardening, the pile-up theory and the unified theory, were tested. Data are provided on the interaction energy stored in pile-up on the one hand and on the stresses surrounding dislocation cells on the other hand. Author

N71-15699# Bhabha Atomic Research Centre, Bombay (India).
INTERDIFFUSION STUDIES IN ALUMINUM-NIOBIUM ZIRCALOY-2-NIOBIUM AND ZIRCALOY-2-TUNGSTEN SYSTEMS
R. V. Patil, G. P. Tiwari, and R. P. Agarwal 1969 31 p refs
(BARC-449) Avail: AEC Depository Libraries

Intermetallic diffusion studies were carried out to establish the bonding characteristics of Zircaloy-2 with niobium and tungsten and of aluminum with niobium by making sandwich and plug type diffusion couples. X-ray and metallographic studies on diffusion couples were made to establish the phase distribution in the diffusion bond. The growth kinetics of the diffusion layer were investigated by fitting the band width in the equation x to the nth power equals kt, where x, n, k, and t are band width, reaction index, reaction constant, and time of anneal respectively. The studies revealed that, where Zircaloy-2-tungsten system obeyed the parabolic relationship with n = 2, aluminum-niobium, and Zircaloy-2-niobium systems exhibited deviations from it. The temperature dependence of the diffusion reaction constant k was also established for these systems. Author (NSA)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N71-14539# British Steel Corp., London (England). Metallurgy Div.
THE ACHIEVEMENT OF ACCURATE X-RAY INTENSITY

MEASUREMENTS FROM NON-METALLIC MATERIALS
J. R. Brown 1968 20 p Supersedes MG/DB/464/68 (MG/D/587/68) Avail: NTIS

It is shown that by paying attention to instrumental technique, in particular by restricting counting rate so that counting losses are small, reliable measurements of X-ray line intensity can be made on iron, calcium oxide, and silica in sinters with an accuracy sufficient for analytical purposes. Author

N71-14540# Wisconsin Univ., Madison.
ANALYTICAL PROCEDURES FOR PREDICTING THE MECHANICAL PROPERTIES OF FIBER REINFORCED COMPOSITES, PART 5 Summary Report, 1 Jul. 1969 - 31 Mar. 1970
Millard W. Johnson, Jr. Wright-Patterson AFB, Ohio AFML 1 Jul. 1970 27 p refs
(Contract F33615-69-C-1735)
(AD-713675; AFML-TR-65-220-Pt-5) Avail: NTIS CSCL 11/4

An integral equation formulation of the equations of linear elasticity is used to examine the interfacial stress and displacement components for a single fiber in an infinite array of fibers. The composite is under uniaxial tension. A theory for calculating composite elastic moduli is also developed. The fibers are of finite length with results restricted to aspect ratio 1. Author (TAB)

N71-14761# North Carolina Univ., Chapel Hill. Materials Research Center.
RESEARCH ACTIVITIES IN THE FIELD OF MATERIALS SCIENCE Annual Technical Progress Report, 1 Jun. 1969 - 31 May 1970
31 May 1970 102 p refs
(Contract ARPA SD-100)
(AD-713198) Avail: NTIS CSCL 11/7

The report gives very brief summaries of active research projects in chemistry, dentistry, geology, and physics. TAB

N71-14824# Washington State Univ., Pullman. Shock Dynamics Lab.
MATERIAL BEHAVIOR IN HIGH SPEED IMPACT Summary Report, 1 Jun. 1969 - 31 May 1970
J. Assay, J. C. Flinn, J. W. Forbes, R. H. Mitchell, and G. E. Duvall Jul. 1970 82 p refs
(Contract F44620-67-C-0087; ARPA Order 985)
(AD-713624; WSU-SDL-70-03; AFOSR-70-2205TR) Avail: NTIS CSCL 20/12

The report consists of a study of the dynamics of dislocation motion and multiplication based on elastic precursor decay in LiF. In Section 2 plans and progress are described for a direct experimental measurement of the threshold dynamic stress and time for dislocation multiplication in LiF. Section 3 contains theoretical procedures for converting the current output of quartz gauges to stress in materials which produce double shock waves because of dynamic failure or phase transitions. These procedures are used in Section 4 to interpret shock measurements on CdS-lucite mixtures. Section V contains a list of nine papers, talks and reports produced under this contract. Author (TAB)

N71-15034*# Indian National Scientific Documentation Centre, New Delhi.
THERMAL CONDUCTIVITY OF REFRACTORY MATERIALS
V. V. Pustovalov 1970 105 p refs Transl. into ENGLISH of the publ. 'Teploprovodnost Ogneuporov' Moscow, Izd. 'Met.,' 1966 Sponsored in part by NASA
(Contract NSF C-466)
(NASA-TT-F-516; TT-68-50635) Copyright. Avail: NTIS CSCL 11B

The laws governing the variations in thermal conductivity of heat insulators, which affect most of the refractory materials, are considered. The parameters which influence the effective thermal conductivity of refractory ceramics are investigated. The variety of equipment and experimental methods for determining the variation of thermal conductivity with temperature over a wide range of temperatures, applicable to refractory materials, is described. Author

N71-15048# Bhabha Atomic Research Centre, Bombay (India).
SPECTROGRAPHIC ANALYSIS OF NIOBIUM OXIDE: AN INTERMITTENT AC ARC METHOD
L. C. Chandola and N. P. Karanjikar 1970 13 p refs
(BARC-495) Avail: AEC Depository Libraries

A spectrographic method is described for the analysis of niobium oxide. The sample is glued to the flat ends of a pair of graphite electrodes and excited by means of an intermittent ac arc. The resulting spectrum is photographed using a grating spectrograph having a 1200 grooves per millimeter grating in the first order. The analysis lines used are Ta 2685.1 A, Fe 2898.4 A, Mn 2605.7 A, Mo 2816.2 A, Pb 2833.1 A, Sn 2863.3 A, and Ti 3078.7 A. A matrix line Nb 2682.8 A served as an internal standard. Tantalum is estimated up to a lower limit of 100 ppM with a precision of + or - 11%. Author (NSA)

N71-15049# Bhabha Atomic Research Centre, Bombay (India).
SPECTROGRAPHIC ANALYSIS OF LITHIUM FLUORIDE. A. DETERMINATION OF Cu, Cr, Mn, Mg, Ni, Ti, AND Pb. B. DETERMINATION OF Na, K, AND Ca
L. C. Chandola and A. S. Rao 1970 11 p
(BARC-496) Avail: AEC Depository Libraries

The following two complementary methods are described for the spectrographic analysis of lithium fluoride. For the determination of Cu, Cr, Mn, Mg, Ni, Ti, and Pb, the sample is mixed with 10% silver chloride as a buffer and cobalt as an internal standard. This mixture is loaded in a graphite electrode and excited in a dc arc at 12 amperes. The spectrum is photographed on a Hilger large quartz spectrograph in which the 0 to 15 sec and 45 to 60 sec periods of the arc are superimposed to obtain one spectrum. For the determination of Na, K, and Ca, the sample is mixed with graphite as buffer and barium as an internal standard. The charge is excited in a dc arc at 10 amperes and spectrum photographed, the exposure time being 60 seconds. The lower limit of estimation is ppM for all the impurities and the precision of the method is + or - 15%. Author (NSA)

N71-15053# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
THERMAL AND ULTRASONIC NONDESTRUCTIVE TESTING METHODS FOR CARBON-CARBON COMPOSITES
D. R. Green and N. E. Dixon May 1970 50 p ref Presented at the Am. Soc. of Mech. Eng. Symp., Albuquerque, N.Mex.
(Contract AT(45-1)-1830)
(BNWL-SA-3064; CONF-700112-1) Avail: NTIS

Thermal and mechanical properties are important factors in the performance of carbon-carbon composites. Flaws and property differences in composite parts can often be detected using ultrasonic and high-speed thermal methods recently developed at Battelle-Northwest (BNW). A feasibility study demonstrating the application of these methods to carbon-carbon composites was conducted. This study made use of a new thermal image transducer method, an infrared scanning method and a high power broadband ultrasonic method using special transducers. Both the thermal transducer and ultrasonic methods require dry contact with the test specimen, but no wet couplant or other preparation is necessary when the surface of the test specimen is reasonably smooth. The range of test specimens and types of defects that could be included in the study was limited by the cost and scarcity of material available for specimens. Author (NSA)

N71-15054# Bhabha Atomic Research Centre, Bombay (India).
THIN FILMS: THEIR PHYSICS AND APPLICATIONS
A. K. Dua and R. P. Agarwala 1970 55 p refs
(BARC-487) Avail: AEC Depository Libraries

Methods of preparation, techniques of thickness measurement, and characteristics of the films are reviewed. Emphasis is placed on properties which can not be measured in bulk, but can be profitably studied in thin films. Their applications, specially in optical, metallurgical, and electronic industries are discussed. Mathematical analysis is omitted in favor of descriptive discussions which though qualitative and much less precise have the advantage of making the review of interest to the nonspecialist. Author (NSA)

N71-15055# Defence Standards Labs., Maribyrnong (Australia).
THE WEATHERING OF VULCANIZED RUBBERS
P. Dunn and S. J. Hart Oct. 1970 38 p refs
(Rept-408) Avail: NTIS

Details are given of a four year trial concerned with indoor storage and outdoor exposure of some vulcanized rubbers based on carbon black or silica-reinforcing materials in styrene-butadiene rubber, ethylene-propylene diene rubber and a butadiene-acrylonitrile rubber blended with poly (vinyl chloride) resin. Storage trials for two years, followed by exposure trials, at four different sites, also for two years, were carried out. Seawater immersion and soil burial trials on the vulcanized rubbers are also described. The effect of the various environments on some of the physical properties of the vulcanizates was studied. Some conclusions are drawn concerning the performance of the vulcanizates as might be expected during typical indoor storage and outdoor use. Author

N71-15056# Defence Standards Labs., Maribyrnong (Australia).
ORIENTATION RELATIONS BETWEEN DENDRITES GROWN IN A HIGHLY UNDERCOOLED MELT
B. L. Jones and G. M. Weston May 1970 8 p refs
(Rept-363) Avail: NTIS

Special orientation relationships were found between the major grains radiating from a single nucleation event into highly undercooled high purity copper. In most instances the grains exhibited a mutual twin relationship indicating a 60 deg rotation about a < 111 > direction; in one instance a 35 deg rotation about a < 110 > direction was observed. Faults in the stacking sequence during early growth of the solid, prior to dendritic solidification, are considered to be responsible for these relationships. Author

N71-15058# Department of Forestry, Vancouver (British Columbia). Forest Products Lab.
CURRENT TRENDS IN DIMENSIONAL STABILIZATION OF WOOD
L. C. Palka Nov. 1970 42 p refs
(VP-X-63) Avail: NTIS

The primary objective is to summarize, within a general system, the many varied methods of wood dimensional stabilization. Emphasis is put on the classification and physical aspects of the processes, based mainly on recent research efforts. Industrial application and costs of wood stabilization are briefly discussed, but the basic chemical mechanisms involved are largely disregarded. Author

N71-15059# Gulf General Atomic, San Diego, Calif.
IRRADIATION BEHAVIOR OF ISOTROPIC CARBONS
J. C. Bokros and D. W. Stevens 24 Feb. 1970 35 p refs Submitted for publication
(Contract AT(04-3)-167)
(PB-191701; GA-9900) Avail: NTIS CSCL 18J

Comparative dimensional data from irradiation experiments that included both high temperature isotropic (HTI) and low temperature isotropic (LTI) carbons show that at high fluences the volume expansion and accelerations in the dimensional change rates are considerably more pronounced for HTI than for LTI carbons. Alloying LTI carbons with up to 15 wt % silicon enhances the dimensional stability slightly at approximately 600 C but has no effect on the behavior in irradiations at higher temperatures. For HTI carbons the effects of the alloying additions are more pronounced. Data from both multiple irradiations at different temperatures and irradiations in which the temperatures were programmed down during the course of the irradiation show that prior irradiation at high temperature markedly enhances the dimensional changes that occur in subsequent irradiations at lower temperature. The implications of these findings to reactor design are discussed. Author (USGRDR)

N71-15062# Johns Hopkins Univ., Baltimore, Md. Dept. of Biophysics.
IMPROVED SUBSTRATES FOR ELECTRON MICROSCOPY Progress Report, 1 Sep. 1969 – 31 Aug. 1970
Michael Beer 31 Aug. 1970 11 p refs
(Contract AT(30-1)-4142)
(NYO-4142-1) Avail: NTIS

Research on graphitization of thin carbon films is summarized. Work on preparation of grids is described along with heat treatment procedures. The crystallinity of treated films is described and the quality of the films evaluated. Specimen preparation using graphite support films is reported. It was concluded that carbon films suitable for electron microscopy can be converted to graphitic films by heat treatment. NSA

N71-15063# Oak Ridge National Lab., Tenn.
THORIUM CERAMICS DATA MANUAL. VOLUME 1: OXIDES
Sigfred Peterson and C. E. Curtis Sep. 1970 74 p refs
(Contract W-7405-eng-26)
(ORNL-4503-Vol-1) Avail: NTIS

Physical, chemical, and mechanical properties of thorium oxide, alone and in combination with other oxides, are compiled from the literature. Thorium-oxygen phase information is followed by data collections on thorium oxide, binary systems with uranium and plutonium oxides, other binaries, and ternary and more complex systems. For each, sections on composition ranges and preparation and fabrication methods described as needed to understand their influence on properties are followed by compilations on crystal properties, thermodynamic properties, change of state, electrical and magnetic properties, heat and mass transport, mechanical properties, chemical properties, and surface properties. Author (NSA)

N71-15064# California Univ., Livermore. Lawrence Radiation Lab.
ACOUSTIC EMISSION TECHNIQUES IN MATERIALS RESEARCH
R. G. Liptai, D. O. Harris, R. B. Engle, and C. A. Tatro 9 Jul. 1970 97 p refs Presented at the Symp. on Advanced Exptl. Tech. in the Mech. of Materials, San Antonio, 9 – 11 Sep. 1970 Submitted for publication Sponsored by AEC
(UCRL-72582; CONF-700907-1) Avail: NTIS

A review of the application of emission analysis to evaluate materials properties and defect structures is presented. Topics discussed include fracture toughness and crack propagation, fatigue, plastic deformation, and creep processes in metals, composites, and rock materials. The status of emission techniques as applied to the evaluation of structural integrity is reported. A complete discussion of experimental techniques and data acquisition and processing systems is given. It is concluded that acoustic emission

techniques have wide applicability to experimental studies in materials research and to evaluation analysis of structural integrity. Directions of future developments and applications are discussed.
Author (NSA)

N71-15066# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
HIGH-TEMPERATURE THERMAL CONDUCTIVITY OF ROUND ROBIN URANIUM DIOXIDE
J. Lambert Bates Jul. 1970 66 p refs
(Contract AT(45-1)-1830)
(BNWL-1431) Avail: NTIS

The thermal diffusivity of stoichiometric uranium dioxide was measured from 16 to 2500 C using a flash thermal diffusivity technique. The thermal diffusivity at lower temperatures was initially higher than expected during initial measurements. After heating to 1200 C or above, the low temperature diffusivity decreased to a reproducible value representative of nearly stoichiometric UO2. This increased diffusivity is attributed to initially hypostoichiometric UO2 which oxidized to a stoichiometric composition at 1200 C or above. Calculated thermal conductivity values agree within + or - 10% below 600 C and within + or - 5% above 600 C with other reported interlaboratory UO2 values. The thermal conductivity exhibits a minimum near 1600 C.
Author (NSA)

N71-15082*# Avco Corp., Lowell, Mass.
HIGH TEMPERATURE COMPOUNDS FOR TURBINE VANES Final Report
R. M. Cannon, Jr. and R. J. Hill 31 Aug. 1970 85 p refs
(Contract NAS3-13213)
(NASA-CR-72794; AVSD-0629-70-RR) Avail: NTIS CSCL 11D

A number of fibrous additives were incorporated into both silicon carbide and silicon nitride ceramic matrices and consolidated by hot pressing methods. The properties of the composites were investigated to determine if any improvement of mechanical properties had resulted. Impact strength was measured in air up to 2400 F in the Charpy mode and stress rupture lives were also measured in air in four-point bending for temperatures up to 2400 F. These data were compared with data obtained under identical conditions for some superalloys. The thermal shock and thermochemical stability characteristics were also determined under simulated gas turbine stator vane environments at 2400 F. It was concluded that the incorporation of SiC whiskers into both SiC and Si3N4 matrices markedly increases the impact strength in the range of room temperature to 2400 F without seriously detracting from the mechanical, thermal shock, or thermochemical stability characteristics of the ceramic matrix.
Author

N71-15175# Royal Aircraft Establishment, Farnborough (England).
THE PREPARATION AND PROPERTIES OF FIBRES OF THE COPOLYMER OF ACRYLONITRILE WITH DIKETENE [POLUCHENIE I SVOICTVA VOLOKON IZ SOPOLIMERA AKRILONITRILA S DIKETENOM]
G. A. Gabrielyan et al Apr. 1970 14 p refs Transl. into ENGLISH from Khim. Volokna (Leningrad), no. 6, 1965 p 13-16
(RAE-Lib-Trans-1464) Avail: NTIS

Polyacrylonitrile fibers with 4-6% of diketene as a comonomer were spun from dimethyl formamide with a breaking length of 23-27 km (i.e. a tenacity of 2.6-3.0 gm/denier) and an elongation of 7-8%. Because of the presence of beta-lactone rings in the comonomer, various types of reactive groups such as -OH, -CONH, -NH2 and -CONHOH were able to be introduced into these fibers by reactions with hexamethylene diamine (HMDA) or hydroxylamine (HA). The treatment with HMDA was found to give fibers that could be dyed with acid or active dyes and with improved thermal stability due to crosslinking. The treatment with HA also gave fiber that could be dyed with acid dyes and a further treatment with an aqueous solution containing Fe(3+) increased the thermal stability of the fibers due to the formation of intermolecular chemical bonds.
Author

N71-15176*# Indian National Scientific Documentation Centre, New Delhi.
STRENGTH AND CREEP OF LAMINATED PLASTICS
V. F. Yatsenko 1970 250 p refs Transl. into ENGLISH from the publ 'Prochnost i Polzuchest Sloistykh Plastikov' Kiev Naukova Dumka, 1966 Sponsored in part by NASA
(Grant NSF C-466)
(NASA-TT-F-461; TT-67-59014) Copyright. Avail: NTIS CSCL 11I

The results are presented of an experimental study on the mechanical characteristics of laminated plastics and wood subjected to compression, tension and bending in the case of prolonged action of constant load and loading at constant rates. The basic laws of the change of resistibility, strength and deformability with time for laminated plastics and wood under the action of forces were established. Engineering methods were worked out for calculating strength and deformability of laminated plastics and wood as elasto-visco-plastic materials with due consideration of the part played by time factor during compression, tension and bending. Rapid methods for determining the characteristics of prolonged strength and deformability of laminated plastics and wood are proposed.
Author

N71-15269# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF EFFICIENCY OF LUBRICANTS FOR DROP FORGING
L. D. Demidov et al 18 Aug. 1970 11 p refs Transl. into ENGLISH from Tr. Mekhan. Inst. (Izhevsk), no. 2, 1967 p 151-157
(AD-713446; FTD-HT-23-411-70) Avail: NTIS CSCL 11/8

A study was made of the basic factors affecting the efficiency of lubricants for drop forging. A description is given of the methods and results of a study of the wetting capacity, film adherence, as well as cooling and heat-insulation properties of 40 different lubricants such as aqueous solutions of lubricant and water suspensions of greases. Use is made of the KBZh concentrate and Na silicate as stabilizers and binders. Aqueous suspensions of greases are poor wetting agents for metal surfaces heated above 100 degrees centigrade due to the formation of vapor blocks in the contact points of lubricant drops. The film of an aqueous suspension of 3-4 percent colloidal graphite and 3-4 percent of KBZh concentrate (as a stabilizer) adhere somewhat better to the metal surface. Salt solutions cool the metal surface more drastically, while a suspension of greases with the KBZh concentrate stabilizer quickly form a solid film which is a poor heat transfer agent. The heat transfer and heat conduction coefficients are presented.
Author (TAB)

N71-15270# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COPOLYMERIZATION OF ESTERS OF BIS (ALLYLOXYMETHYL) PHOSPHINIC ACID WITH METHYLMETHACRYLATE
L. A. Eliseeva et al 27 Aug. 1970 18 p refs Transl. into ENGLISH from Vysokomolekul. Soedin., Ser. B (Moscow), v. 11, no. 2, 1969 p 104-106
(AD-713459; FTD-HT-23-482-70) Avail: NTIS CSCL 7/3

A study has been made of the polymerization of bis(allyloxmethyl) phosphinates of a given general formula and copolymerization of these phosphinates with methylmethacrylate (MMA). The study was undertaken because polymers of this type exhibit valuable properties such as enhanced fire resistance or good adhesion to metals. The esters alone did not polymerize, but yielded copolymers with MMA in MMA/phosphorus-containing monomer

ratios of 96/4 to 84/16. The copolymers were solid transparent blocks insoluble in the usual solvents of poly(methylmethacrylate). The thermomechanical curves are characteristic of cross-linked systems. Starting mixtures containing over 20 percent organophosphorus monomers yielded rubber-like products. The swelling curves of the polymers in dichloroethane indicated that swelling is accompanied by weight losses as a result of the extraction of low-molecular-weight products from the swollen polymer. Author (TAB)

N71-15271# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
INTERACTION OF CURIUM SESQUIOXIDE WITH REFRACTORY METAL MATRICES IN PRESSED AND SINTERED CERMET COMPACTS
J. A. Donovan, D. T. Rankin, J. E. Stuckey (Hendrix Coll.), and W. R. McDonell 1 Jun. 1970 24 p refs Presented at the 16th Ann. Meeting of the Am. Nucl. Soc., Los Angeles, 28 Jun.–2 Jul 1970
(Contract AT(07-2)-1)
(PP-MS-70-10; Conf-700608-21) Avail: NTIS

No reaction was observed between B-type Cm2(244)03 and tungsten, molybdenum, or rhenium matrices in cermet compacts fabricated by cold pressing and sintering at temperatures up to 1850 C. Reaction was observed, however, between the oxide and tantalum matrices sintered as low as 1400 C. Cold pressing and sintering at the temperatures produced generally wellconsolidated Cm2O3-refractory metal compacts of 85% or greater shear modulus c44 of graphite when all dislocations are pinned is thus equal to greater than 0.40 × 10 to the 11th power dynes per square centimeter. The results can be correlated with electron-microscope observations and interpreted in terms of nucleation theory of radiation damage or in terms of a difference in the availability of sinks for the displaced atoms. Author (NSA)

N71-15276# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
CORRESPONDING STATES AND THE GLASS TRANSITION FOR ALKALI METAL NITRATES
C. A. Angell and D. B. Helphrey [1970] 25 p refs Submitted for publication
(Grant NSF GP-8517)
Avail: Issuing Activity

In order to establish a set of corresponding temperatures for the much-studied molten alkali metal nitrates, estimates of the ideal glass transition temperatures for NaNO3 and KNO3 are made from available thermodynamic data, and shown consisitent with experimental glass transition temperatures obtained by extrapolation from binary solution (hydrate melt) data. T sub g values are obtained in the same manner for the other alkali metal nitrates; the spread of values among the five salts found being only 18 C, thereby largely justifying isothermal comparisons of their properties despite the 160 C spread in melting points. The order-disorder transition in sodium nitrate is examined and the relation of this class of transition to the glass transition phenomenon considered. Equations from a zeroth order, order-disorder theory for the glass transition are used to give a qualitative account of the change in heat capacity at the glass transition for sodium nitrate. Author

N71-15361# Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies.
ENVIRONMENT-SENSITIVE MACHINING BEHAVIOR OF NONMETALS
A. R. C. Westwood and R. M. Latanision Oct. 1970 56 p refs Submitted for publication
(Contract N00014-70-C-0330)
(AD-713595; RIAS-TR-70-10C; TR-2) Avail: NTIS CSCL 11/2

Liquid environments can influence the efficiency of machining nonmetallic solids in a variety of ways, e.g., by serving as lubricants, coolants, or particle dispersants. Because of its technological potential, the characteristics and possible mechanisms of this latter phenomenon -- the Rebinder effect -- receive primary consideration in this paper. For crystalline ceramics, Rebinder effects in machining arise because of the influence of the environment on near-surface dislocation behavior. Effects resulting from adsorption-induced changes in the surface free energy of the solid are of minor importance. Rebinder effects can also occur in non-crystalline solids, however, and recent observations on such effects in various glasses are described. The possibility that these effects are caused by a stress-plus-chemisorption-induced redistribution of sodium ions in the near-surface region is discussed. The importance of considering the total cutting system, environment - solid - tool, in any account of environment-sensitive machining is stressed, for environments which facilitate material removal when one type of tool is used can be detrimental to the effectiveness of another tool with a different cutting action. Author (TAB)

N71-15370# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF OIL FILMS ON THE ADHESION OF POLYMERS TO METAL
G. D. Mirzoev et al 20 Aug. 1970 10 p refs Transl. into ENGLISH from Tr. Tadzhiksk. Selskokhoz. Inst. (Stalinabad), v. 13, 1968 p 73–76
(AD-713450; FTD-HT-23-445-70) Avail: NTIS CSCL 11/1

Steel cylinders were coated with 0.05-0.1 mm layers of machine oil, diesel oil, motor oil, automobile lubricant, or glycerol. The cylinders were heated at 310 degrees for 20-100 min, cooled and coated with a film of polycaprolactam (I). The adhesive strength (A) between I and the cylinder was at a maximum, i.e. 375 kg/sq cm when the cylinders were coated with machine oil and heated during 40 min. the control samples, which were carefully degreased before the application of I, and A equals 50 kg/sq cm. The increase of A is due to the polymn. of the oil on the steel surface during heating. The obtained polymer had better A to I than steel. Motor oils, which contain antioxidants and detergents, do not polymerize readily and thus do not increase A appreciably. Author (TAB)

N71-15402# Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies.
ADSORPTION-SENSITIVE MECHANICAL AND MACHINING BEHAVIOR OF SODA-LIME GLASS
A. R. C. Westwood, G. H. Parr, Jr., and R. M. Latanision Sep. 1970 23 p refs
(Contract N00014-70-C-0330)
(AD-713594; TR-1) Avail: NTIS CSCL 11/2

A study was made of the influence of water, toluene, the n-alkanes and the n-alcohols on the pendulum hardness, fracture, and drilling(machining) behaviour of a soda-lime glass. The energy, theta, required to propagate cracks was determined by a double-cantilever technique. Drilling experiments revealed, however, that despite the lower value of theta for glass in water, this environment is not an effective cutting medium, and that the higher alcohols and alkanes are superior by factors of up to twenty times. Of particular interest is the observation that the effectiveness of the latter environments varies non-linearly with molecular chain length, being a maximum in heptyl alcohol and heptane, respectively. It was also noted that by mixing two alcohols or alkanes of different chain length, it is possible to reproduce the drilling characteristics of alcohols or alkanes of intermediate chain length in the homologous series. The results of this work reveal that the environment-sensitive machining behaviour of glass in essentially non-aqueous environments is not determined by the water content of the environment, or by any influence of the environment on the ease with which cracks may be propagated, or by the dielectric constant, dipole moment, viscosity, or any other obvious environmental parameter. The possibility that such behaviour could arise as a consequence of a stress-plus-chemisorption-induced redistribution of sodium ions is discussed. Author (TAB)

N71-15403# Air Force Systems Command, Wright-Patterson AFB, Ohio. Materials Lab.
STIFFNESS AND EXPANSION ESTIMATES FOR ORIENTED AND RANDOM FIBROUS COMPOSITES Technical Report, Apr. – Sep. 1969
J. C. Halpin and N. J. Pagano Aug. 1970 22 p refs
(AD-713099; AFML-TR-69-341) Avail: NTIS CSCL 11/4

There are many technological applications for materials composed of short oriented or randomly arranged fibers interconnected by a bonding substance. A random arrangement of fibers in space can be treated analytically as a laminated solid. In this approximation the homogeneous material is considered to be mathematically equivalent to a material composed of layers corresponding to the volume fraction of fibers of the particular orientation in the material being modeled. The success of the lamination approximation is strongly dependent upon the assumption of physical volume averaging in real materials combined with an ability to estimate the stiffness and expansion properties for an oriented short-fiber ply. Approximate procedures for estimation of ply properties are advanced, using the Halpin-Tsai equations and Schaperys analysis. Substantial agreement is achieved between the experiment for both the oriented and random problems.
Author (TAB)

N71-15404# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATION OF THE SYSTEMS P2O5-Sb2O3-Cr2O3 AND P2O5-Sb2O3-V2O5
V. K. Dombrovskaya et al 10 Aug. 1970 13 p refs Transl. into ENGLISH from the book 'Neorganicheskiye Steklovidnyye Pokrytiya i Materialy' Riga, Izd-Vo Zinatne, 1969 p 101 – 106
(AD-713449; FTD-HT-23-372-70) Avail: NTIS CSCL 11/2

A study was made of glass formation in the systems phosphorus pentoxide-antimony trioxide-chromic oxide and phosphorus pentoxide-antimony trioxide-vanadium pentoxide by means of differential thermal analysis with simultaneous recording of the change in electrical conductivity and X-ray analysis of the firing products. Certain physicochemical and electrical properties of glasses in the phosphorus pentoxide-antimony trioxide-chromic oxide system were investigated. The possibility of using complex thermal and qualitative X-ray analysis for studying melting processes and the characteristics of glass and crystalline-glass materials was demonstrated.
Author (TAB)

N71-15469* Applied Space Products, Inc., Palo Alto, Calif.
INTUMESCENT PAINTS Patent
John A. Parker and George M. Fohlen, inventors (to NASA) Issued 20 Oct. 1970 (Filed 9 Feb. 1968) 4 p Cl. 106-15; Int. Cl. C09d5/18 Sponsored by NASA
(NASA-Case-ARC-10099-1; US-Patent-3,535,130; US-Patent-Appl-SN-704224) Avail: NTIS CSCL 11C

The preparation of aromatic nitroamino compounds for flame resistant coatings is described. The emphasis is on para-nitroaniline sulfate; other possibilities include the sulfate, or sulfonate, of ortho-nitroaniline and meta-nitroaniline. The powdery solid is dispersed in cellulose nitrate and a solvent such as alcohol or ketone.
N.E.N.

N71-16475# Sandia Corp., Albuquerque, N.Mex.
BONDABILITY OF RTV SILICONE RUBBER
Nicholas J. De Lollis Aug. 1970 18 p refs Sponsored by AEC
(SC-RR-70-517) Avail: NTIS

A method for improving the bondability of cured RTV silicone is described. The method is based on the use of excited oxygen plasma in a glow discharge chamber. Surface characteristics and bond strength, before and after treatment, are reported. Significance of the results in the light of present adhesion theory is also discussed.
Author

N71-16545* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
PROCESS FOR CONDITIONING TANNED SHARKSKIN AND ARTICLES MADE THEREFROM Patent
Frank A. Burgett and Jerry C. Poradek, inventors (to NASA) Issued 1 Sep. 1970 (Filed 19 Jun. 1968) 3 p Cl. 8-94.12; Int. Cl. C14c11/00, 5/00
(NASA-Case-XMS-09691-1; US-Patent-3,526,473; US-Patent-Appl-SN-738119) Avail: US Patent Office CSCL 11G

A process is described for conditioning tanned sharkskin so that it will have a high degree of abrasion resistance and pliability over extreme temperature ranges (−250 to 300 F) and be free of undesirable fish odor. The process includes removing the oil with a solvent, providing a thorough air drying, applying a diodorizer to the oil-free skin, a second thorough air drying, and a short preshrink bakeout. Clothing made from these materials are abrasive resistant, durable, and pliable.
Official Gazette of the U.S. Patent Office

N71-16584# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
PHASE EQUILIBRIA, ELECTRICAL CONDUCTANCE, AND DENSITY IN THE GLASS-FORMING SYSTEM ZnCl2 + PYRIDINIUM CHLORIDE; A DETAILED LOW-TEMPERATURE ANALOGUE OF THE SiO2 + Na2O SYSTEM
A. J. Easteal and C. A. Angell 1970 42 p refs
(Contract AT(11-1)-2008)
(COO-2008-2) Avail: NTIS

In a study of ZnCl2-based binary chloride melts which may serve as analogues of the well-known and technologically important glass-forming binary systems based on SiO2 and BeF2 as first component, a detailed phase equilibrium, electrical conductance and density study of the system zinc chloride + pyridinium chloride was carried out. In contrast to the better-known ZnCl2 + alkali halide systems, this present system reproduces in great detail the phase relations and physicochemical behavior of the classic Na2O + SiO2 system, though at temperatures reduced by a factor of about 1/3. Electrical conductance data were analyzed in terms of the three parameter equation k = the reciprocal of the square root of AT exp B/(T-T sub o, and the ideal glass transition temperature T sub o found to closely parallel the experimentally measured glass transition temperature T sub g. T sub o and T sub g composition dependences.
Author

N71-16688* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SOLDER FLUX WHICH LEAVES CORROSION-RESISTANT COATING Patent
Albert Bauman, inventor (to NASA) Issued 20 Oct. 1970 (Filed 22 Aug. 1967) 3 p Cl. 260-404.5, Int. Cl. C09f1/00 Continuation-in-part of US Patent Appl. SN-457879, filed 21 May 1965 Sponsored by NASA
(NASA-Case-XNP-03459-2; US-Patent-3,535,362; US-Patent-Appl-SN-681942) Avail: US Patent Office CSCL 11G

The flux, for soldering metals such as copper, and a method of using it are described. The fluxing agent is hydrazine monoperfluoro alkanoate, and is prepared by neutralizing an aqueous solution of a perfluoro alkanoic acid with hydrazine at room temperature. It is particularly adapted for use with lead-tin solder in a 60/40 weight ratio, respectively. The flux results in a strong, corrosion resistant joint.
N.E.N.

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see: 08 Computers.

N71-14508# Eidgenpssiche Technische Hochschule, Zurich (Switzerland).
LINEAR ALGEBRAIC TREATMENT OF DIGITAL SIGNALS AND SYSTEMS [LINEAR-ALGEBRAISCHE BEHANDLUNG DIGITALER SIGNALE UND SYSTEME]
Hansjuerg Mey (Ph.D. Thesis) 1969 158 p refs In GERMAN; ENGLISH summary
(Rept-4341) Avail: NTIS

The conventional switching theory, based on the Boolean Algebra, is very well known to engineers, but the fact, that digital systems can also be successfully treated by means of linear algebra is widely unknown. Demonstrated is the applicability of the linear theory to the problems of characterization, analysis and synthesis of digital circuits and for producing new results in this domain. Author

N71-14513# Technische Hogeschool, Eindhoven (Netherlands).
LINEAR DYNAMICAL SYSTEMS IN HILBERT SPACE
Johannes de Graaf (Ph.D. Thesis) 1970 185 p refs
Avail: NTIS

CONTENTS:
1. PART 1: PLANE WAVES IN LINEAR HOMOGENEOUS MEDIA p 11–128 refs (See N71-14514 05-19)
2. PART 2: SOME GENERAL PROPERTIES OF LINEAR DYNAMICAL SYSTEMS p 131–190 refs (See N71-14515 05-19)

N71-14514# Technische Hogeschool, Eindhoven (Netherlands).
PART 1: PLANE WAVES IN LINEAR HOMOGENEOUS MEDIA
In its Linear Dyn. Systems in Hilbert Space 1970 p 11–128 refs (See N71-14513 05-19)
Avail: NTIS

A class of propagation phenomena in a one dimensional homogeneous medium is considered. The plane waves are described by partial differential equations based on a vector valued function consisting of complex components and a differentiation-like operator. The Fourier representation of a differentiation-like operator is a matrix which is holomorphic on a simply connected open neighborhood of the real axis in the complex plane. In the case of a differential operator this holomorphic matrix reduces to a matrix polynomial. The analytic behavior of eigenvalues and eigenvectors of holomorphic matrices are studied, and the properties of the differentiation-like operators are investigated. The initial value problem, mode decompositions, and conservation laws are discussed. It is proved that whenever the imaginary parts of the frequencies of the wave system are nonpositive, there exists a quadratic Liapunov functional containing differentiation-like operators of the same type as that in the original partial differential equations. Author

N71-14515# Technische Hogeschool, Eindhoven (Netherlands).
PART 2: SOME GENERAL PROPERTIES OF LINEAR DYNAMICAL SYSTEMS
In its Linear Dyn. Systems in Hilbert Space 1970 p 131–190 refs (See N71-14513 05-19)
Avail: NTIS

A discussion is presented on the general properties of linear dynamic systems described by a differential equation consisting of a continuous trajectory and a densely defined linear operator, both in a suitable Hilbert space, and a source term. A constructive approach is given to the theory of one-parameter semigroups of Hilbert space operators. An example of a holomorphic semigroup is included concerning the coefficients of a differential operator which generates a holomorphic semigroup. The concept of propagative linear dynamic systems is introduced. This concept makes it possible to derive a very general causality theorem for source problems. Author

N71-14521# Tokyo Univ. of Education (Japan). Dept. of Physics.
MULTI-LOOP SELF-ENERGY OPERATORS IN DUAL RESONANCE MODEL
Sunao Sakai [1970] 29 p refs
(TUEP-70-27) Avail: NTIS

The reduction formula is derived to obtain both the planar and non-planar n-loop self-energy operators. The non-planar operators are derived by the simple replacement of planar operators. The analysis of n-loop amplitude is not made except for singularities of two-loop operators. Author

N71-14525# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
TABLES OF TOROIDAL HARMONICS. 3: FUNCTIONS OF THE FIRST KIND: ORDERS 0 – 10 Final Report
Henry E. Fettis and James C. Caslin Jul. 1970 399 p refs
(AD-713103; ARL-70-0127) Avail: NTIS CSCL 12/1

The report contains eleven-figure tables of the Legendre function of the first kind P sub N–1/2, sup M(s) for integral values of N and M. It is a continuation of the previous two volumes which gave values of the previous two volumes which gave values of the functions of the second kinds, Q sub N–1/2, sup M(s) also for integers N and M. As in the previous tables, the argument s is given directly and also as cosh eta. The tables are so constructed that the degree N–1/2 covers the same range as in the previous reports. For Volume 1, see N69-32737; for Volume 2 see N70-26887. Author TAB

N71-14535# Pittsburgh Univ., Pa. Dept. of Physics.
RESEARCH IN GENERAL RELATIVITY Final Report
Ezra T. Newman and Allen I. Janis Wright-Patterson AFB, Ohio ARL Aug. 1970 170 p refs
(Contract F33615-70-C-1081)
(AD-713140; ARL-70-0136) Avail: NTIS CSCL 20/10

The report discusses work in three areas of research connected with general relativity: The development of trapped surfaces, a new approach to equations of motion, and Some applications of group theory to general relativity, in particular to equations of motion. Author (TAB)

N71-14544# Forsvarets Forskningsansalt, Stockholm (Sweden). Planeringsbyran.
ON THE REDUCTION OF A SQUARE MATRIX TO THE JORDAN CANONICAL FORM
Gustaf Borenius Aug. 1969 41 p
(FOA-P-C-8238-11) Avail: NTIS

Two methods of reduction are treated. Both are elementary, requiring only ordinary matrix algebra. By the first method it is explicitly described how the transformation matrix can be constructed in a sequence of elementary steps, however, the computations can be somewhat lengthy in practice. The other method describes a comparatively quick and easy method for determining the Jordan canonical form of a given square matrix, but is not very well suited for the explicit construction of the transformation matrix. Both methods are illustrated by a numerical example. Author

N71-14568# Eidgenossische Technische Hochschule, Zurich (Switzerland).
ON THE EXISTENCE OF H-SPACE STRUCTURES ON A CERTAIN CLASS OF POLYHEDRA [UEBER DIE EXISTENZ VON H-RAUM-STRUKTUREN AUF EINER GEWISSEN KLASSE VON POLYEDERN]
Hans Ulrich Hoesli (Ph.D. Thesis) 1969 59 p refs In GERMAN
(Diss-4320) Avail: NTIS

Considered is the existence of homogeneous space structures on a class of finite polyhedra that are free of torsion and whose complete cohomologies can be produced algebraic by two linear independent elements. It is stipulated that the generating elements

have uneven dimensions and are primitive if such a polyhedron is a homogeneous space. Results show that the dimensions of the generating elements can be 1, 3, 5, and 7 and that other dimensional numbers are not possible. Transl. by G.G.

N71-14570# Eidgenossische Technische Hochschule, Zurich (Switzerland).
PROOF OF EQUIVALENCE FOR FORD-FULKERSON AND KELLEY ALGORITHMS AND COMPARISON OF METHODS FOR OPTIMAL TIME-COST PLANNING [AEQUIVALENZBEWEIS DER ALGORITHMEN VON FORD-FULKERSON UND VON KELLEY UND VERFAHRENSVERGLEICH BEZUEGLICH DER KOSTENOPTIMALEN TERMINPLANUNG]
Jacot des Combe (Ph.D. Thesis) 1970 110 p refs In GERMAN; ENGLISH summary
(Diss-4355) Avail: NTIS

Considered are methods of planning and scheduling project networks. The mathematical bases of two algorithms (the Kelley algorithm and the Ford-Fulkerson algorithm) are presented and it is shown that they are mathematically equivalent. In addition to this, by means of the theory of the Kelley algorithm, programs can be improved and execution time shortened. Comparing the performances of the programs reveals the superiority of the Kelley algorithm. Author

N71-14677# Forsvarets Teletekniska Lab., Stockholm (Sweden).
REPAIR AND MAINTENANCE [REPARATION OCH UNDERHALL]
H. Ebenfelt May 1969 12 p refs In SWEDISH
(FTL-A-A08-8) Avail: NTIS

The questions of how maintenance affects system quality, measured as effectiveness, as well as to what extent maintenance is profitable, are both important and of immediate interest. Examples of models which illustrate these aspects are discussed. They are related to the following elements in maintenance: (1) supervision of function, (2) control of function, (3) remedial maintenance, and (4) preventive maintenance. Author

N71-14678# Forsvarets Teletekniska Lab., Stockholm (Sweden).
DISTRIBUTION OF RESOURCES AND THE GOAL OF RELIABILITY [FOERDELNING AV RESURSER OCH TILLFOERLITLIGHETSMAL]
H. Ebenfelt May 1969 27 p ref In SWEDISH
(FTL-A-A08-7) Avail: NTIS

There are mainly two factors which influence system formation: (1) the worth of the system to the user and (2) the total cost of the system. To give a system a high value in relation to cost is essentially a problem of distribution of resources. Distribution criteria, effectiveness and cost models, and some practical methods for distribution are discussed. Author

N71-15069# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
A MEASURE FOR HIGH-ORDER NONRANDOMNESS IN SHORT SERIES OF RESPONSES
W. A. Wagenaar and C. L. Truijens 1970 16 p refs
(IZF-1970-19; TDCK-56512) Avail: NTIS

Literature concerning radomization experiments shows a basic need for a method that measures high-order sequential dependencies in short sequences. A method of measurement developed for this purpose is described. The method is suitable for computation of high-order dependencies, independently for each order of analysis, and in sequences with at least 100 elements. The measure distinguishes between negative and positive recency, and also permits comparison of results based on different sequence lengths and different numbers of alternatives. Author

N71-15070# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
SERIAL NONRANDOMNESS AS A FUNCTION OF DURATION AND MONOTONY OF A RANDOMIZATION TASK
W. A. Wagenaar 1970 12 p refs
(IZF-1970-18; TDCK-56482) Avail: NTIS

In the literature the effect of nonrandomness in randomization by humans has been attributed to limitations of both memory and attention. A crucial factor in this context concerns the effect of task duration. It is shown that nonrandomness decreases with time spent at the task. This appears to be due to increasing monotony of the task, rather than to task duration only. A theory is presented which deals with the present and other recent data. Author

N71-15091*# Auburn Univ., Ala. Engineering Experiment Station.
ERROR ANALYSIS OF NUMERICAL INTEGRATION SCHEMES
15 Nov. 1970 59 p refs
(Contract NAS8-20104)
(NASA-CR-102958; TR-23) Avail: NTIS CSCL 12A

The accuracy of numerical integration schemes is dealt with and the computational errors involved therein are considered. The round-off errors are assumed to be random in nature and simulations are run to investigate the effect of noisy inputs on the errors. Simulations are run to study the effect of the mode of operation and the change in input level on the errors. Some conclusions are drawn from the results of these simulations. A method based on the concept of practical stability is developed and shown to be applicable among other examples to the error equation developed from the differential equation to be integrated, thus giving the error bounds of this system. Author

N71-15112*# Texas A&M Univ., College Station. Inst. of Statistics.
STATISTICAL SIMULATION PROCEDURES
R. N. Tremelling, II, W. B. Smith, L. J. Ringer, and J. L. Oglesby Oct. 1970 58 p refs
(Grant NGR-44-001-095)
(NASA-CR-111545; TR-4) Avail: NTIS CSCL 12A

Multivariate problems are considered utilizing the stratified Monte Carlo as an effective technique when theoretical derivations become impractical. The amount of stratification determines the gain in accuracy over simple Monte Carlo estimates. It is concluded that the technique may be used for a wide range of applications, and should be considered one of the better simulation techniques available. E.M.C.

N71-15216# Wisconsin Univ., Madison. Mathematics Research Center.
THE KANTOROVICH THEOREM AND ERROR ESTIMATES FOR NEWTON'S METHOD Technical Summary Report
Louis B. Rall and Richard A. Tapia Feb. 1970 21 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-713698; MRC-TSR-1043) Avail: NTIS CSCL 12/1

In this note the authors derive a simple recurrence relation for the best possible error estimates the Kantorovich theorem can give for Newtons method. This formulation has, as immediate consequences, all previously derived error estimates and some improved error estimates. Author (TAB)

N71-15249# Wisconsin Univ., Madison. Mathematics Research Center.
BEST POSSIBLE FLOATING POINT ARITHMETIC Technical Summary Report
J. M. Yohe Mar. 1970 33 p refs

(Contract DA-31-124-ARO(D)-462)
(AD-713699; MRC-TSR-1054) Avail: NTIS CSCL 12/1

The report presents an algorithm for floating point arithmetic, using single-length arithmetic registers, which yields the most accurate approximation which can be expressed in the given floating point format, the greatest lower bound, or the least upper bound for the result of the operation, whichever is specified by the programmer. This makes the algorithm particularly useful for implementation of interval arithmetic. Author (TAB)

N71-15250# Wisconsin Univ., Madison. Mathematics Research Center.
DISCRETE SPLINES VIA MATHEMATICAL PROGRAMMING Technical Summary Report
O. L. Mangasarian and L. L. Schumaker Jan. 1970 34 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-713700; MRC-TSR-1028) Avail: NTIS CSCL 12/1

Mathematical programming is used to investigate constrained minimization problems in real Euclidean space which are the discrete analogs of spline problems posed as minimization problems in a Banach space. Existence, uniqueness, characterizing properties and computational methods are given. Author (TAB)

N71-15277# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE BIRKHOFF-TURRITTIN TRUNCATION PROBLEM FOR SYSTEMS OF ORDINARY LINEAR DIFFERENTIAL EQUATIONS Technical Summary Report
Donald A. Lutz Dec. 1969 26 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-713701; MRC-TSR-1023) Avail: NTIS CSCL 12/1

The Birkhoff-Turrittin truncation problem consists of the application of a linear transformation to a system of linear ordinary differential equations at a singular point of pole type which has the effect of truncating the expansion of the new coefficient. The degree of truncation is not known in general. For the case of systems having a regular singular point, a bound on the degree of truncation is established which extends Turrittins result of the case of a simple pole. Author (TAB)

N71-15278# Wisconsin Univ., Madison. Mathematics Research Center.
ON EXTREMAL PROBLEMS RELATED TO EIGENVALUES OF LINEAR DIFFERENTIAL OPERATORS, 1
Pedro Nowosad Sep. 1969 77 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-713706; MRC-TSR-1016) Avail: NTIS CSCL 12/1

The report discusses the problem of extremization of Re lambda, say, in the equation Ax = lambda rho(x), where A is a linear differential operator, x epsilon X, rho epsilon Q, with X and Q two suitable set of functions, under the additional condition the integral over rho = 1. A comparison theorem involving equalities is proved which brings to light the existence of an analytical structure in the problem. Several applications to concrete cases are given. Author (TAB)

N71-15279# Wisconsin Univ., Madison. Mathematics Research Center.
ON CONSTRUCTION OF FRACTIONAL REPLICATES AND ON ALIASING SCHEMES
U. B. Paik and W. T. Federer Jan. 1970 49 p refs
(Contract DA-31-124-ARO(D)-462; Grant PHS-2-R01-GM05900)
(AD-713696; MRC-TSR-1029) Avail: NTIS CSCL 12/1

A generalized method of constructing irregular fractional replicates from a complete factorial is developed. An invariance property and an aliasing structure property of fractional replicate plans are presented. Author (TAB)

N71-15532# Research Inst. of National Defence, Stockholm (Sweden).
THE MOMENT OF DISTANCE BETWEEN TWO POINTS, SELECTED INDEPENDENTLY OF EACH OTHER FOR A CONSTANT PROBABILITY WITHIN AN n-DIMENSIONAL UNIFORM HYPERSPHERE [MOMENTEN TILL AVSTANDET MELLAN TVA PUNKTER, VALDA OBEROENDE AV VARANDRA UR EN KONSTANT SANNOLIKHETSTAETHET INNANFOER EN N-DIMENSIONELL ENHETSHYPERSFAER]
Staffan Wrigge Sep. 1969 9 p In SWEDISH; ENGLISH summary
Avail: NTIS

Let d sub n be the distance between the points. E times (the distance between the points sup m) is derived directly by evaluation of 'the mean value integral' over the three dimensional space (r, theta, S) where r and S are the distances from the points to the origin respectively and theta is the angle at the centre between r and S. For the case where n = 2 the moment is used to determine the apportionment (moment in this case means zero point moment). Author

N71-15586# Hunter Coll., New York.
ON FRICKE MODULI
Linda Keen [1970] 22 p refs
(Grant NSF-8789)
Avail: Issuing Activity

Let S be a closed Riemann surface of genus g from which m conformal disks have been removed. S has signature (g;m). The Teichmuller space T(S) is a topological manifold of real dimension tau = 6g-6+3m and has a natural real analytic structure. Fricke describes a set of global real analytic coordinates for this space. They are the traces of certain matrices in SL(2,R), and simple real analytic functions of them; these determine the Fuchsian group G which represents S. A set of global real analytic coordinates for T(S) is defined. They are all traces of matrices of SL(2,R), and all the matrices involved correspond to elements of the Fuchsian group. Therefore, these moduli all have a geometric interpretation on the surface S as lengths of certain simple closed geodesics. Author

N71-15590# Oak Ridge National Lab., Tenn.
ASYMPTOTIC DISTRIBUTION OF EIGENVALUES OF RANDOM MATRICES
W. H. Olson and V. R. R. Uppuluri Sep. 1970 54 p refs
(Contract W-7405-eng-26)
(ORNL-4603) Avail: NTIS

The properties of the eigenvalues of random matrices as related to the energy levels are discussed. In high energy regions it is impossible in practice to determine exactly all the energy levels and only the statistical properties of the energy levels in these regions is presented. Mathematical models and equations of state are provided to prove the asymptotic distribution of eigenvalues. Author

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N71-14519# Weather Wing (1st), San Francisco, Calif. 96553
OCTOBER CLIMATE OF SOUTHEAST ASIA. Final Climatological Study
Sep. 1970 69 p Revised *Its* Special Study No. 105-11/10
(AD-713120) Avail: NTIS CSCL 4/2

The report deals with the climate of North Vietnam, Republic of Vietnam, Laos, Cambodia, and Thailand for October. Essentially based on previously available data, however, precipitation analyses.

ceiling/visibility, and upper air flow are new. Contains brief notes on the climate of Southeast Asia and the geographical features of the Republic of Vietnam, North Vietnam, Cambodia, Laos, and Thailand. Discusses the precipitation, thunderstorms, cloudiness, visibility and obstructions to vision, combined ceiling/visibility, temperature, relative humidity, surface and upper winds, miscellaneous phenomena and sea operations. Contains a station locator and topography map. Isoline analyses (map scale 1:9,000,000) are given for precipitation days, mean, maximum, and minimum precipitation, days with thunderstorm, mean cloudiness, percent frequency of ceiling/visibility greater than 5000/5 and greater than 1000/2 1/2 (7 and 16 LST), daily max and min temperatures and mean relative humidity. For selected stations tabular data on fog days, percent frequency visibility < 1 mile and < 5 miles (7 and 16 LST) are given also. Mean streamline charts (1:37,500,000) are given for 2,000 feet, 850 mb, 700 mb, 500 mb, 300 mb, and 200 mb levels. Also included are charts of mean position of polar front and ICZ 1:17,000,000) typhoon tracks (1:10,000,000), sea surface currents, temperatures, frequency of breakers, sea swell (1:10,000,000). Author (TAB)

N71-14520# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

TRANSACTIONS OF THE LENINGRAD INSTITUTE OF APPLIED GEOPHYSICS

N. L. Byzova et al 14 Sep. 1970 54 p refs Transl. into ENGLISH from Tr. Inst. Prikl. Geofiz. (Leningrad), 1967 p 18–38 and 67–74

(AD-713785; FTD-HC-23-14-69) Avail: NTIS CSCL 4/2

Contents: Two cases of a change in the meteorological parameters in the lower atmospheric layer; Certain features of the meteorological regime of the lower atmospheric layer in the case of low clouds and fog; Wind velocity field near the Ostankin. TAB

N71-14522# Naval Weather Service, Washington, D.C.

SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS. MEDITERRANEAN MARINE AREAS. VOLUME 7: AREA 24, NORTH AEGEAN SEA; AREA 25, SOUTH AEGEAN SEA; AREA 26, CRETE; AREA 27, BENGHAZI

Oct. 1970 643 p

(AD-713084) Avail: NTIS CSCL 4/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. The areas discussed include the Crete and Benghazi. TAB

N71-14524# Naval Weather Service, Washington, D.C.

SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS: MEDITERRANEAN MARINE AREAS. VOLUME 6: AREA 20: WEST IONIAN SEA. AREA 21: MALTA. AREA 22: GULF OF SIDRA. AREA 23: EAST IONIAN SEA.

Oct. 1970 642 p ref

(AD-713295) Avail: NTIS HC $10.00/MF $0.65 CSCL 4/2

The data contained in these tables were obtained from tape data Family II (TDF-II), Marine Surface observations. TDF-II was primarily funded by the Naval Weather Service Command and selected by NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. The area includes the East and West Ionian Sea, Malta, and the Gulf of Sidra. Author (TAB)

N71-14545# Naval Weather Service, Washington, D.C.

SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS. MEDITERRANEAN MARINE AREAS. VOLUME 3: AREA 8: NORTH MENORCA. AREA 9: MALLORCA. AREA 10: ALGIERS. AREA 11: CORSICA

Oct. 1970 642 p

(AD-713779) Avail: NTIS HC $10.00/MF $0.65 CSCL 4/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. The areas included are Menorca, Mallorca, Algiers and Corsica. TAB

N71-14548# Naval Weather Service, Washington, D.C.

SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS. MEDITERRANEAN MARINE AREAS. VOLUME 4: AREA 12, SARDINIA; AREA 13, ANNABA; AREA 14, ROME; AREA 15, SOUTH TYRRHENIAN SEA

Oct. 1970 642 p

(AD-713780) Avail: NTIS CSCL 4/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. The areas discussed in this report include Sardinia, Annaba, Rome and the Tyrrhenian Sea. Author (TAB)

N71-14550# Naval Weather Service, Washington, D.C.

SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS. MEDITERRANEAN MARINE AREAS. VOLUME 5: AREA 16, SOUTHWEST SICILY; AREA 17, TRIPOLI; AREA 18, NORTH ADRIATIC SEA; AREA 19, SOUTH ADRIATIC SEA

Oct. 1970 642 p

(AD-713648) Avail: NTIS CSCL 4/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. The areas discussed in this document include Sicily, Tripoli, and the Adriatic Sea. Author (TAB)

N71-14551# Naval Weather Service, Washington, D.C.

SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS. MEDITERRANEAN MARINE AREAS. VOLUME 8: AREA 28, RHODES; AREA 29, CENTRAL LEVANTINE BASIN; AREA 30, ALEXANDRIA; AREA 31, NORTH CYPRUS

Oct. 1970 642 p

(AD-713085) Avail: NTIS CSCL 4/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. The areas included are Rhodes, Central Levantine Basin, Alexandria (Egypt), and North Cyprus. TAB

N71-14599# Weather Squadron (15th), Detachment 3, Charlestown, S.C.

LATIN AMERICAN FORECAST CENTER FORECASTERS' HANDBOOK Final Report

Floyd F. Hauth Oct. 1970 70 p refs

(AD-713173) Avail: NTIS CSCL 4/2

The handbook contains a summary of the geography and climatology of South America and adjacent oceans; analysis and forecasting procedures for extratropical; Southern Hemisphere.

Systems, and tropical systems; jet stream analysis and its application forecasting; application of divergence and vorticity principles in analysis and forecasting; and satellite mosaic interpretation.
Author (TAB)

N71-14623# Air Weather Service, Scott AFB, Ill.
A SUMMARY OF AIRLINE WEATHER-RADAR OPERATIONAL POLICIES AND PROCEDURES
Paul Kadlec Sep. 1970 21 p refs
(AD-713636; AWS-TR-238) Avail: NTIS CSCL 4/2

The report discusses and summarizes the Weather-Radar operational policies and procedures of eleven US commercial airlines.
Author (TAB)

N71-14658# Joint Publications Research Service, Washington D.C.
METEOROLOGY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 240 10 Nov. 1970 p 8–13 refs (See N71-14656 05-30)
Avail: NTIS

News items and research abstracts on the following topics are summarized: launch of the Meteor meteorological earth satellite; rain effect on propagation of millimeter and submillimeter radio waves; satellite measurement of water vapor content in mesosphere and stratosphere; CO2 absorption bands at increased pressure in Venusian atmosphere; convergence of convective currents in the atmosphere; distribution of meteorological parameters at Irkutsk; statistical analysis of the radiation field of a cloudy sky; Agl crystallizing effect; and propagation of passive admixtures in a turbulent media.
E.C.

N71-14729# National Weather Records Center, Asheville, N.C.
CLIMATOLOGICAL DATA FOR ANTARCTIC STATIONS, NO. 10, JANUARY 1967–DECEMBER 1968
May 1970 253 p Sponsored in part by ONR and NSF
(AD-713187) Avail: NTIS CSCL 4/2

The publication summarizes available Antarctic meteorological observations for the period January 1967-December 1968. It was compiled at the National Weather Records Center, Asheville, North Carolina, in cooperation with the U. S. Weather Bureau.
Author (TAB)

N71-15057# Texas Univ., Austin. Antennas and Propagation Div.
DETECTION OF CLEAR-AIR TURBULENCE BY RADAR
James R. Scoggins and Robert A. Clark 1 Apr. 1970 29 p refs Sponsored by NSF
(PB-192141; P-43) Avail: NTIS CSCL 04A

Measurements obtained from an airplane, a sensitive and vertically-pointing radar, and rawinsonde data were used to investigate to what extent the radar can detect clear air turbulence. Rawinsonde data were used to determine the distribution of moisture in the vertical over Austin. A theory was developed which relates fluctuations in the index of refraction to moisture gradients. The data indicate an association between the disturbed index of refraction measured by the radar and onboard the airplane, and the vertical gradients of moisture. Measurements of accelerations of the airplane generally were not associated with radar measurements.
Author (USGRDR)

N71-15073# Texas A&M Research Foundation, College Station. Dept. of Meteorology.
FEASIBILITY OF WARM-CLOUD MANAGEMENT Final Report
Horace R. Byers and Bernice Ackerman 12 Jun. 1970 63 p refs
(Contract DI-14-06-D-6469)
(PB-192259) Avail: NTIS CSCL 04B

Convective clouds that did not extend above a 12,000 to 15,000-foot freezing level were studied for two summers in southeast Texas to assess the feasibility of their management. A Queen Air airplane of the National Center for Atmospheric Research, instrumented for cloud physics measurements provided the principal means for gathering data. It was found that clouds about 8000 feet in depth and of about that diameter near their tops were able to produce light rain which rapidly became heavier as the clouds grew through the next 1000 feet or more. Analysis of the data was aimed at obtaining details of the structure and dynamics of the cloud, and testing a model for prediction of natural behavior for the purpose of distinguishing artificially modified from natural behavior. On the basis of cloud data the question of direct water extraction versus enhancement of convective energy leading to delayed but possibly greater precipitation is considered.
Author (USGRDR)

N71-15074# Israel Meteorological Service, Bet-Dagan. Research Div.
OPTIMUM STATION NETWORK IN THE TROPICS
G. Steinitz, A. Huss, R. Sinai, A. Manes, and Z. Alperson May 1970 78 p refs
(Contract ESSA-E-267-(68)N)
(PB-194261) Avail: NTIS CSCL 04B

The optimal interpolation method is applied to upper air data in the tropics. The dependence of interpolation accuracy on station separation and randon observation error is shown in a tabular and graphical form for several meteorological fields at the 850 and 500 mb surfaces. An optimum station density is derived for each field, the criterion being that interpolation errors should not exceed the random observational errors.
Author (USGRDR)

N71-15075# Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
RADAR HURRICANE RESEARCH Final Report, 1 Sep. 1969–31 Aug. 1970
H. V. Senn and C. L. Courtright Oct. 1970 41 p refs
(Contract ESSA-E21-41-70(N))
Avail: NTIS

Radar precipitation data gathered before, during and after multiple seedings of the eye wall region of hurricane Debbie on 18 and 20 August 1969 are used to test the Stormfury hypothesis that such seedings cause changes in storm structure. Examination of precipitation tilt showed that shear is most cyclonic at the lowest levels; greatest in the layer below the melting level; very significant in the middle layer, between five and nine km; and outflow is always indicated at the higher levels. The bright band was distributed in most quadrants of the eye wall region. Changes in major axis orientation of the eye wall region followed only one seeding on the 18th, but followed each seeding on the 20th. It appears that the seedings were responsible for the observed variations.
Author

N71-15088# Bureau of Meteorology, Sydney (Australia).
MONTHLY CLIMATE DATA: SURFACE, AUSTRALIA, JUNE 1970
Jun. 1970 68 p
Avail: NTIS

Climatological statistics most likely to meet the needs of commerce, education, primary and secondary industry, research and other fields are tabulated. The mean monthly data include pressure, cloud, temperature, sunshine, rain, evaporation, and wind measurements for each district.
Author

N71-15115*# National Aeronautics and Space Administration, Washington, D.C.
THE 30-MB SYNOPTIC ANALYSES FOR THE 1969

SOUTHERN HEMISPHERE WINTER DERIVED WITH THE AID OF NIMBUS 3 (SIRS) DATA

A. J. Miller, F. G. Finger, and M. E. Gelman Dec. 1970 30 p refs Prepared by Weather Bur., Suitland, Md.
(NASA-TM-X-2109; X-2109) Avail: NTIS CSCL 04B

Employing both Nimbus 3 (SIRS) retrieval data (heights and temperatures derived from the measured radiances) and conventional rawinsonde data, 30-mb synoptic analyses for selected periods during the Southern Hemisphere winter of 1969 are constructed. The analyses indicate several warming pulses penetrating southward to the higher middle latitudes throughout the winter season. These warmings could be not classified as strong by Northern Hemisphere standards and were not accompanied by major circulation changes. The 30-mb maps, as well as time-section type diagrams of the radiance values, indicate that during the warming period the entire synoptic pattern rotated eastward around the polar axis at a rate of about 15 deg longitude per day. Analyses for the final spring warming period of late October through mid-November show that the warm air center which was initially near Australia slowly progressed toward the pole, with the reversal of the temperature gradient completed by the end of the period. Author

N71-15130*# Lockheed Missiles and Space Co., Huntsville, Ala.
EXTREME DISTRIBUTIONS OF GROUND WINDS (3 TO 150 METERS) AT CAPE KENNEDY, FLORIDA

J. L. Wood, B. L. Palmer, B. C. Johnson, and J. E. Tyson Aug. 1970 107 p refs
(Contract NAS8-24927)
(NASA-CR-102972; HREC-4927-1; LMSC/HREC-D162482) Avail: NTIS CSCL 04B

Developed are probability distributions by using three years of Cape Kennedy tower winds available for seven levels from 3.0 to 152.4 m. The three-year sample of tower data is subjected to a statistical test. The various applications of extremal distributions to the tower data and the development of synthetic profiles provide the following specific results: (1) the probability of not exceeding the wind speed at each of seven levels between the surface and 152.4 m; (2) the joint probability of not exceeding the wind speed at 152.4 m and any other level below; and (3) the joint probability of not exceeding a given wind speed at 152.4 m and a given profile for a particular exposure period. Supporting tables, graphs, and examples of applying these results are included. Author

N71-15134# Washington Univ., Seattle.
TIME-LONGITUDE SECTIONS OF TROPICAL CLOUDINESS, DECEMBER 1966 – NOVEMBER 1967

J. M. Wallace Washington Natl. Environ. Satellite Center Jul. 1970 40 p refs
(Contract ESSA-E-161-70(N))
(ESSA-TR-NESC-56) Avail: SOD $0.50

Digitally processed mosaic strips of satellite photographs are presented in unique arrays. Time-longitude sections, each composed of zonal strips five degrees in width and containing a season of data, are presented for the year December 1966 through November 1967. Thirty-two of these sections show the tropical cloud systems around the world between 20 N and 20 S. This arrangement is convenient for the study of time variations of tropical cloud systems. Cloudiness frequently is observed to persist for many days within a zonal strip. Using the time-longitude sections presented, it has been possible in some cases to trace, from Africa to the western Pacific, the westward movement of cloud clusters identifiable throughout the period of travel. Author

N71-15143# Deutscher Wetterdienst, Offenbach am Main (West Germany).
REPORTS OF THE GERMAN METEOROLOGICAL SERVICES, VOLUME 16, NO. 116: THE AERONAUTICAL CONDITIONS AT INTERNATIONAL COMMERCIAL AIRPORTS [BERICHTE DES DEUTSCHEN WETTERDIENSTES, BAND 16, NR. 116: DIE FLUGKLIMATISCHEN VERHAELTNISSE AN INTERNATIONALEN VERKEHRSFLUGHAEFEN]

Hans Guss 1970 100 p refs In GERMAN; ENGLISH summary
Avail: NTIS

In the interests of the German commercial aviation the meteorological variables of state significant for take off and landing have been represented geographically in form of aeronautical climatological diagrams for airports from a great number of international commercial airports of all continents. Apart from a global view of the aeronautical climatological conditions of the most important commercial airports of the world these charts and their tables supplement the climatic monographies and climatic atlases, thus giving a better view almost of all climates of the earth. Author

N71-15144# Deutscher Wetterdienst, Offenbach am Main (West Germany).
REPORTS OF THE GERMAN METEOROLOGICAL SERVICES, VOLUME 16, NO. 117: THE ENERGY TRANSFORMATIONS IN THE GROUND ATMOSPHERE [BERICHTE DES DEUTSCHEN WETTERDIENSTES, BAND 16, NR. 117: DIE ENERGIEUMSAETZE IN DER BODENNAHEN ATMOSPHAERE]

Helmut Krause 1970 43 p refs In GERMAN; ENGLISH summary
Avail: NTIS

Three different energy equations are the fundamental laws for the understanding of physical processes in the atmosphere near the ground: (1) a formula which describes the energy transformations at the earth's surface, that is the energy balance equation of the earth's surface; (2) a formula which describes the thermodynamical energy transformations in a volume of air, that is the thermodynamical energy balance equation of a volume of air; and (3) a formula which describes the transformations of the kinetic energy of the eddy motion in a volume of air, that is the equation of turbulent energy. Author

N71-15152# National Aeronautical Establishment, Ottawa (Ontario).
TURBULENCE MEASUREMENTS IN AND NEAR THUNDERSTORMS

D. S. Treddenick Jun. 1970 24 p refs
(NRC-11703; LR-534) Avail: NTIS

In May of 1969, the NAE T-33 participated in a co-operative program of storm turbulence measurement. During the program, the T-33 made several thunderstorm penetrations in the vicinity of Tinker Air Force Base, Oklahoma. The aim of the program was to explore turbulence characteristics in and near thunderstorms and to correlate aircraft turbulence measurements with a ground based radar. Data recorded by the T-33 are used to compute true gust velocity time histories and to determine the variation in mean square gust velocities during the storm penetrations. Author

N71-15163# Weapons Research Establishment, Salisbury (Australia).
A SEASONAL MODEL FOR THE ZONAL WIND IN THE ALTITUDE RANGE 35 TO 75 km AT WOOMERA (31 DEG S)

R. J. Curnow Jun. 1970 27 p refs
(WRE-TN-HSA-172) Avail: NTIS

A seasonal model for the zonal wind in the height range 35 to 75 km is presented. This is based on data from between thirty and fifty falling sphere and parachute experiments conducted during the period March 1962 to December 1966. A similar model for the meridional wind is also discussed but it is rejected. The models are compared to the CIRA 1965 model for 30 deg S. Author

N71-15150# Weapons Research Establishment, Salisbury (Australia).
ANOMALOUS UPPER ATMOSPHERIC PARAMETERS DERIVED FROM TWO AERO-HIGH ROCKET FIRINGS
K. H. Lloyd and C. H. Low Jul. 1970 24 p refs
(WRE-TN-HSA-175) Avail: NTIS

Observations made on glow clouds produced by the release of aluminized grenades from two Aero-High upper atmosphere sounding rockets fired at Woomera, South Australia are presented. The large release from one of the rockets produced a rapidly expanding halo which is examined in detail. The atmospheric parameters derived from the observations on the releases showed some curious anomalies. Explanations for these are discussed. Author

N71-15215# Army Missile Command, Redstone Arsenal, Ala. Physical Sciences Lab.
THE CHARACTERISTIC COEFFICIENTS TECHNIQUE FOR PROBABILITY MODELS OF WIND PROFILES IN MISSILE DESIGN AND ENVIRONMENT ANALYSIS
O. Essenwanger 1970 16 p refs
(AD-713522) Avail: NTIS CSCL 4/2

Three forms to describe global conditions for computer analysis of the wind influence upon missile systems have been common in the past: individual wind profiles, intra and inter-level correlation matrices, and synthetic wind profile. All three methods show one or several kinds of deficiency: Voluminous data input, data bias, unrealistic vertical relationship, complex and costly computation, or difficulty in associating probability. The above problems can be solved by the characteristic coefficient technique. The individual wind profile is described by a number of characteristic coefficients with subsequent reduction to one variable only. Three equations and a set of constants express completely the variety of global wind conditions and association with any wind probability threshold. Based upon the above tool sets of global wind models can be derived. The geographic and seasonal variation of a system of nine model groups is discussed and proves to be rational. Author (TAB)

N71-15220# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
WORLD METEOROLOGICAL CENTER, TRANSACTIONS: SELECTED ARTICLES
S. A. Bortnikov et al 18 Sep. 1970 63 p refs Transl. into ENGLISH from Mirovoi Meteorol. Tsentr. (Moscow), no. 14, 1966 p 10-22, 48-58, and 92-101
(AD-713777; FTD-MT-24-173-70) Avail: NTIS CSCL 4/2

Contents: Some results of operative short-range forecasting of the geopotential based on complete equations for two atmospheric levels; Experiment in forecasting on the basis of a three-level hydrodynamic model; Numerical solution of hydromechanics equations for atmospheric motions; A three-level scheme for forecasting meteorological elements based on complete equations. TAB

N71-15223*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STANDARD DEVIATION OF VERTICAL WIND SHEAR IN THE LOWER ATMOSPHERE
George H. Fichtl 17 Dec. 1970 25 p refs
(NASA-TM-X-64554) Avail: NTIS CSCL 04B

The standard deviation, sigma, of vertical two-point longitudinal velocity fluctuation differences is analyzed experimentally with eleven sets of turbulence measurements obtained at a 150-meter ground winds tower site. It is concluded that the sigma per u sub zero is proportional to the cube root of f delta z per u sub zero, where the coefficient of proportionality is a function of fz per u sub zero and u sub zero per fL sub zero. The quantities f and L sub zero denote the Coriolis parameter and the surface Monin-Obukhov stability length, respectively; u sub zero is the surface friction velocity; delta z is the vertical distance between the two points over which the velocity difference is calculated; and z is the mean height of the mid-point of the interval delta z above natural grade. The results of the analysis are valid for u sub zero per fL sub zero greater than 20 and less than 2000. Author

N71-15252# RAND Corp., Santa Monica, Calif.
CLIMATE MODIFICATION AND NATIONAL SECURITY
R. R. Rapp Oct. 1970 10 p refs Presented at the Meteorol. Tech. Exchange Conf., Annapolis, 21-24 Sep. 1970
(AD-713428; P-4476) Avail: NTIS CSCL 4/2

The report discusses nine projects on the problems of climatic simulation. Included in the report are ocean models, atmospheric radiation, convective cloud models, numerical models, numerical weather prediction, and cumulus cloud models. TAB

N71-15262# Army Foreign Science and Technology Center, Washington, D.C.
PRELIMINARY DATA ON RADAR INDICATORS OF HAIL DANGER CENTERS IN THE GISSAR VALLEY
T. V. Sevastyanova et al 26 Jun. 1970 9 p refs Transl. into ENGLISH from the Russian
(AD-713468; FSTC-HT-23-256-70) Avail: NTIS CSCL 4/2

Being able to distinguish hail-producing from non-hail-producing clouds in order to determine the probability of modifications occurring in convective clouds, is very important. Radar detection appears to be a more effective method in comparison to the synoptic method. In 1966, the Soviet Union made an attempt in the Gissar Valley to recognize the characteristics which would have permitted distinguishing radar reflections from hail producing and heavy rain producing clouds, as well as from clouds containing no precipitable moisture. Clouds were observed by using circular scanning and verticle profiles. From the profile data of the 197 observation centers the following radar characteristics of the clouds were found: magnitude of maximum reflectivity zm in decibels and its position in the cloud; thickness of the zone of increased reflectivity, its position in the cloud; the altitude of these zones and their temperature characteristics; the magnitude of radar reflectivity. Author (TAB)

N71-15263# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
APPLICATION OF THE METHOD OF CANONICAL CORRELATIONS IN METEOROLOGY
L. S. Gandin 3 Sep. 1970 33 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 208, 1967 p 5-22
(AD-713774; FTD-MT-24-150-70) Avail: NTIS CSCL 4/2

Application of canonic correlations to problems in meteorology and specifically to forecasting characteristics of meteorological fields is discussed. In meteorological terms, the problem of canonic correlation can be formulated as follows: find a linear combination of predictors and of predicants that will have an optimally close statistical relationship among each other. Algorithms and covariational (or correlational) matrices are constructed. To improve the accuracy of the input matrices (or assumption matrices), two alternate methods are suggested: (1) covariation (or correction) functions are plotted as a preliminary measure, i.e., an autocovariation function for two variables and a cross-covariation function to link these variables; (2) random errors in measurement of the variables are calculated. A specimen calculation of a long-range forecast of the relationships between the average monthly surface water temperature in the North Atlantic in November and the average monthly air temperature over the European part of the SSSR in December is included. TAB

N71-15397# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HYDROMETEOROLOGICAL SCIENTIFIC RESEARCH

CENTER OF THE USSR, TRANSACTIONS, NO. 15, 1967, SELECTED ARTICLES
E. N. Blinova et al 31 Aug. 1970 88 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauchno-Issled. Isentr SSSR (USSR), no. 15, 1967 p 3–47
(AD-713775; FTD-MT-24-170-70) Avail: NTIS CSCL 4/2

Contents: General circulation of the atmosphere and hydrodynamic long-term forecasting of weather; Generalization of the hydrodynamic theory of climate and long-term weather forecasting; Experiments with a four-level scheme of forecasting the geopotential in the troposphere and lower stratosphere taking into account radiation and turbulent thermal conductivity. TAB

N71-15398# Air Force Global Weather Central, Offutt AFB, Nebraska.
AFGWC MACRO-SCALE UPPER AIR ANALYSIS MODEL
August L. Shumbera 15 Mar. 1970 31 p refs
(AD-713119; AFGWC-TM-70-2) Avail: NTIS CSCL 4/2

The AFGWC macro-scale numerical upper air analysis program for the Northern Hemisphere is described. The program produces wind, height and temperature analyses at 14 levels from 850 to 10 mbs, and moisture analyses at four levels, from 850 to 400 mbs. A detailed explanation of the derivation of first guess fields 2is presented. The analysis technique is the method of successive corrections to a first guess field. Constraints are applied to the stability of each layer. Radiation type corrections are applied above 100 mb to observations taken in daylight to remove instrumental errors. Author (TAB)

N71-15399# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
A MORE RIGOROUS EXPRESSION FOR THE RATE OF DROPLET GROWTH
Richard D. H. Low 1970 13 p refs
(AD-713559) Avail: NTIS CSCL 4/2

One facet of weather modification is the dissipation of a warm fog or the improvement of visibility within it by means of seeding with condensation nuclei. The analysis of the effectiveness of this type of nuclei finds its roots in the mathematical expression for condensational growth - one of the few fundamental equations in cloud physics which has, only during the past twenty years, been recognized as a distinct branch of physical meteorology and, more recently, as an integral part of atmospheric physics. Being a young science, cloud physics has embodied areas of study which are in need of better understanding and further development, one such area being the processes of condensation and precipitation. The fundamental equation is applicable to the growth of an isolated and immobile saturated solution droplet in a stationary medium of moist air. It is the purpose of this paper to examine this equation critically from a theoretical point of view. Author (TAB)

N71-15400# Weather Wing (1st), San Francisco, Calif. 96553
SEPTEMBER CLIMATE OF SOUTHEAST ASIA Final Climatological Study
Stanton R. Withrow Aug. 1970 66 p Supersedes Rept 1WW-SS-105-11/9 Jul. 1968
(AD-713132; Rept-1WW-SS-105-11/9) Avail: NTIS CSCL 4/2

The study is one of a revised series of publications dealing with the climate of Southeast Asia on a monthly basis. For the purpose of this study, Southeast Asia is defined as North Vietnam, Republic of Vietnam, Laos, Cambodia, and Thailand. Author (TAB)

N71-15401# Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
AN INVESTIGATION OF THE INFLUENCE OF WATER WAVES ON THE ADJACENT AIRFLOW
Kenneth Laverne Davidson (Ph.D. Thesis) Aug. 1970 278 p refs
(Contract N00014-67-A-0181-0005)
(AD-713694; Rept-08849-2-T) Avail: NTIS CSCL 4/2

An observational study was made during August, September and October 1968 to investigate the influence of water waves on the adjacent airflow. Simultaneous measurements of wind and temperature fluctuations and waves were made from a tower on Lake Michigan. 11 periods were analyzed, and 8 included simultaneous measurements of velocity and temperature fluctuations at two levels above the mean water level. Hot-wire anemometers with X-probe sensors were used to obtain both the along-wind and vertical components of the fluctuating wind. High response resistance wires were used to measure temperature fluctuations and a capacitance gauge was used to measure the waves. Data were analyzed to obtain variance and covariance spectra over a frequency range from .01 to 15 Hz and are presented over a range from .03 to 10 Hz. Author (TAB)

N71-15513# Israel Program for Scientific Translations Ltd., Jerusalem.
ELEMENTS OF THE INFORMATION THEORY OF ATMOSPHERIC VISIBILITY
V. K. Kagan et al 1971 149 p refs Transl. into ENGLISH of the publ. 'Osnovy Informatsionnoi Teorividimosti v Atmosfere' Leningrad, Gidromet., 1968 Sponsored by NSF and ESSA
(TT-70-50053) Copyright. Avail: NTIS

By analyzing the threshold conditions of vision from the general standpoint of information theory, criteria can be derived which are satisfied by an optimum detector. In every particular case, the problem falls into three successive stages: (1) determination of the radiation field and computation of the reduced fluxes from the elements of the sky; (2) derivation of the threshold conditions of detection for a detector with a particular functional scheme; and (3) comparison of the sky radiation with the total radiation of the object and the intervening haze and the construction of a detector characteristic relating the signal power to the probability of detection and the false signal probability. The general theory is first presented, using the basic model of radiation flux as a stationary Poisson process. The basic principles of the biophysics of vision are surveyed and the empirical data are compared with the theoretical concepts developed. The field of short-wave atmospheric radiation is considered and examples of the derivation of the threshold conditions of vision and computations of the detector characteristics are given. Author

N71-15542# Joint Publications Research Service, Washington, D.C.
PHYSICS OF THE UPPER ATMOSPHERE
V. F. Tulinov 15 Dec. 1970 18 p refs Transl. into ENGLISH from Tr. Tsent. Aerol. Observ. (Moscow), no. 90, 1969 p 17–29
(JPRS-51990) Avail: NTIS

The structure of upper atmospheric layers was investigated to solve problems associated with the motion of rockets and satellites at high altitudes. Emphasis is given to development of methods for conducting rocket experiments and to results of investigating the high layers of the atmosphere using meteorological rockets. R.B.

N71-15560# Israel Program for Scientific Translations, Ltd., Jerusalem.
RADAR MEASUREMENT OF PRECIPITATION RATE
A. M. Borovikov et al 1970 116 p refs Transl. into ENGLISH of the publ. 'Radiolokatsionnye Izmereniya Osadkov' Leningrad, Gidrometeorol. Iz-Vo., 1967 Supported by ESSA and NSF
(TT-69-55101) Copyright. Avail: NTIS

An experimental investigation is described aimed at determining the possibilities and limitations of radar measurement of

precipitation. Various aspects of the investigation are dealt with under the following headings: (1) methods of radar measurement of precipitation, (2) Physical principles of the measurement by the radar signal intensity, (3) equipment and procedure for obtaining precipitation data, (4) observational procedure and data processing, and (5) results of comparative observations. D.L.G.

N71-15585# Finnish Meteorological Office, Helsinki.
OBSERVATIONS OF RADIOACTIVITY 1969
1970 80 p ref
(Rept-9) Avail: NTIS

The fractions of aerosol beta activity that decay within 4 hours, and those that remain four days after the end of the sampling period are presented. Measurements of beta activity in precipitation and settled dust collected at Helsinki and Ivalo are included. Additional measurements of fission products in the air carried out since January 1960 are also reported. Author

N71-15679# Joint Publications Research Service, Washington, D.C.
METEOROLOGY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 241 27 Nov. 1970 p 8–19 refs (See N71-15677 05-30)
Avail: NTIS

News releases are presented on laser meteorology, computer selection of meteorological distribution functions, hydrometeorological data processing, and ALGOL 60 language. Abstracts on various meteorological literature are also included. J.A.M.

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N71-14542# Air Force Cambridge Research Labs., Bedford, Mass.
EARTH ENVIRONMENTAL NOISE FIELDS
F. A. Crowley and H. A. Ossing 19 Aug. 1970 15 p *Its* Air Force Surv. in Geophys. No. 224
(AD-713172; AFCRL-70-0460) Avail: NTIS CSCL 17/7

A new method to approach earth noise field problems in inertial component testing is presented. This method is considered superior to accepted quiet site and motion suppression structure techniques. The approach is to describe earth noise by determining: (1) the class of the random motion; (2) the level of motion; (3) the mode of motion; and (4) the component relationships. The efficacy and rationale of this technique is demonstrated in an experiment that results in the removal of earth noise error terms from gyro data. Author (TAB)

N71-14624*# Houston Univ., Tex. Dept. of Electrical Engineering.
A HYBRID COMPUTER STUDY OF A DYNAMIC SHIP POSITIONING SYSTEM
Richard H. St. John, Jr., and William P. Schneider Aug. 1970 109 p refs
(Grants NGL-44-005-084; NSF GK-2436)
(NASA-CR-115874; RE-8-70) Avail: NTIS CSCL 17G

Dynamic positioning is a method of anchoring a vessel in deep areas of the ocean. The essential components of a dynamic positioning system are a vessel with positioning forces; a position measuring system; a comparator; and a controller. These components position a vessel by interacting with each other and with the environment. Mathematical models define each component of the positioning system. The hybrid computer simulates the positioning system, and the aerodynamic and hydrodynamic forces present on the ocean's surface. The excitation/response characteristics of the model for a variety of environmental conditions are investigated. Optimum headings with respect to positioning thrust result for each environmental case. A vessel search algorithm is developed to locate an optimum heading. Author

N71-14955*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TRACKING AND NAVIGATIONAL ACCURACY ANALYSIS
In its Space Programs Sum. No. 37-65, Vol. 2 for the Period 1 Jul.–31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 24–39 refs (See N71-14951 05-07)
Copyright. Avail: NTIS CSCL 22A

The effects of transmission media on DSN navigational accuracy are considered, with emphasis on tropospheric effects on navigation errors. The temporal variation of tropospheric errors measured by radiosonde balloon data is discussed. Surface weather measurements are also investigated as a calibration technique. The effects of the earth's ionosphere on tracking data and the sensitivity of navigation errors to the ionospheres for differences in seasons, solar cycle, and mission geometries are described. R.B.

N71-15221# Ohio Univ., Athens. Dept. of Electrical Engineering.
ALL-WEATHER, LOW-LEVEL NAVIGATION Semiannual Report, Oct. 1969–Apr. 1970
Sep. 1970 33 p refs
(Contract DAAB07-68-C-0084; Proj. Themis)
(AD-713420; ECOM-0084-1/SA;SAR-1) Avail: NTIS CSCL 17/7

The multifaceted work associated with the early phases of the Ohio University Themis project has gradually been consolidated into the broad areas of receiver and computer technology as applied to producing the All-Weather, Low-Level Navigation System. The design and breadboarding of a tuned radio frequency (TRF) receiver has been completed. Results of laboratory tests of the TRF breadboard indicate the receiver is phase-stable to within one electrical degree; its design objective. Effort on the maximum likelihood estimator (MLE) has been divided into two efforts. First, verification of earlier theoretical investigation comparing phase-locked loop and MLE receiver structures was accomplished. Second, refinements in the physical realization of the MLE were achieved and a brassboard design frozen. The airborne reference frequency synthesizer has been designed and is being fabricated. In addition, precision stability measurements are being accomplished on a new crystal standard to ascertain its suitability for future airborne use. Work continues in the area of system integration and analysis, particularly in the application of Kalman filtering techniques for estimating position accurately and in the broad area of man-machine relationships required in the low-level, all-weather navigation system. Author (TAB)

N71-15354# Army Engineer Topographic Labs., Fort Belvoir, Va.
DETERMINATION OF LATITUDE AND LONGITUDE OF UNKNOWN STATIONS FROM PHOTOGRAPHS OF A SATELLITE AGAINST STELLAR BACKGROUND INDEPENDENT OF ANY DISTANCE
Angel A. Beldini [1970] 14 p
(AD-713508) Avail: NTIS CSCL 17/8

The method is based on observations of an active or passive satellite, photographed against a stellar background, from a camera situated at an unknown station. The station position's coordinates are then fixed, geocentric latitude and longitude, independently of any distance. Author (TAB)

N71-15383# Army Missile Command, Huntsville, Ala.
THE APPLICATION OF A SOLID STATE HELIUM-NEON GAS LASER TO MISSILE GUIDANCE
Wilber H. Gibson [1970] 10 p

(AD-713527) Avail: NTIS CSCL 17/7

The paper describes the development of laser gyro systems and compares them with conventional gyro systems. The uses of the laser gyro system are given and the advantages of the system for future applications are outlined. Author (TAB)

N71-15391# Army Electronics Command, Fort Monmouth, N.J.
THE DEVELOPMENT OF A KALMAN FILTERING ALGORITHM FOR HYBRID NAVIGATION IN ARMY AIRCRAFT
Joseph A. Knight 1970 14 p refs
(AD-713553) Avail: NTIS CSCL 17/7

Control system solutions have been formulated using Kalman filtering -- a data processing technique whereby a dynamic error model of the system, as well as the statistical parameters of the instrumentation and measurement noise, are combined in a state space equation to estimate the system errors. Hybrid navigation is a natural candidate for such control techniques and several studies have been made in this general area although no systems designed for Army aircraft have been flown. This paper will present the analytical results obtained in the first phase of a US Army program to determine the feasibility of hybrid navigation for Army purposes. The program will culminate in flight tests in 1970-71. The paper will address four major areas: synoptic statement of Kalman filter principles, general determination of needs unique to the Army, error model analysis of the candidate navigation subsystem, and development of the Kalman filter algorithm. Author (TAB)

N71-15392# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
AIRCRAFT OPTIMUM MULTIPLE FLIGHT PATHS Final Technical Report, May 1969 - May 1970
Robert L. Schultz and Philip S. Kilpatrick JANAIR Jun. 1970 138 p refs
(Contract N00014-69-C-0339)
(AD-713136; JANAIR-700709; Rept-12802-FR) Avail: NTIS CSCL 17/7

The objectives of the study are to apply existing optimization techniques of modern control theory to compute aircraft trajectories and to define an approach to implement the results into an improved military air traffic management (ATM) system. The recommended concept provides positive control of the airspace by acquiring aircraft formations, determining aircraft positions, assigning landing priorities, calculating optimum trajectories subject to constraints, and transmitting steering commands to the aircraft. Although the concept is developed in terms of an aircraft carrier operational setting and the analysis concentrates on minimum fuel trajectories, the concept is generally applicable to military ATM problems such as Army helicopters or fixed wing aircraft in the vicinity of an airbase, and the analysis techniques are candidates for other aircraft optimization problems such as minimum time-to-climb or minimum time-to-descent trajectories. The purpose of this concept is to increase overall operational capability by increasing the overall range or time-over-target of aircraft, reducing the threat to aircraft carriers, and simplifying and automating ATC procedures for pilots and controllers. An analytical approach was developed in this study to reduce the complexity of the optimum trajectory calculation so that acceptable accuracy is achieved with minimal computer capacity. The optimum trajectories are computed by an iterative solution technique that converges rapidly to the final trajectory. Author (TAB)

N71-15512# Institute for Telecommunication Sciences, Boulder, Colo.
EVALUATION OF THE LORAN TESTS AT ANNISTON, ALABAMA, AND PANAMA CITY, FLORIDA
Bernard Wieder and James S. Washburn Jun. 1970 53 p refs
(ESSA-TR-ERL-166-ITS-107) Avail: SOD $0.55

The results from an evaluation of the differential loran technique conducted in southeastern United States are discussed. The discussion centers on equipment performance and data error analysis. The results from the evaluation show relatively large systematic discrepancies from predicted loran coordinates. The analysis attempts to isolate the errors attributable to long- and short-range propagation effects from systematic errors in the manpack receivers and the loran chain. Recommendations are made for possible future tests to determine more clearly long- and short-range loran propagation effects for a given area. Author

N71-15543*# Massachusetts Inst. of Tech., Cambridge. Measurement Systems Lab.
A STUDY OF PROBLEMS IN AIRCRAFT NAVIGATION AND CONTROL Final Report
Kenneth R. Britting Nov. 1970 21 p refs
(Grant NGR-22-009-229)
(NASA-CR-115905; RN-62) Avail: NTIS CSCL 17G

Research on the performance of the various types of pure inertial and hybrid navigation systems is reported. Flight control theory and statistical estimation techniques are also discussed. Author

N71-15582* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CONTROL SYSTEM FOR ROCKET VEHICLES Patent
Norman L. Crabill and John M. Riebe, inventors (to NASA) Issued 6 Sep. 1966 (Filed 21 Oct. 1964) 6 p Cl. 60-35.55
(NASA-Case-XLA-01163; US-Patent-3,270,505; US-Patent-Appl-SN-405632) Avail: US Patent Office CSCL 22A

A system for aerodynamic control of an exhaust stream nozzle is described. The control system utilizes secondary injection of a fluid into the exhaust stream, and the injection hardware is located on a swiveling nozzle to provide inertial lag of the system when the vehicle is disturbed. R.B.

N71-15583* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REACTANCE CONTROL SYSTEM Patent
Richard Schmidt, inventor (to NASA) Issued 6 Sep. 1966 (Filed 26 Dec. 1963) 10 p Cl. 244-1
(NASA-Case-XMF-01598; US-Patent-3,270,985; US-Patent-Appl-SN-333770) Avail: US Patent Office CSCL 22A

A drive mechanism for operating a reactance attitude control system for navigable bodies passing through a fluid or nonfluid medium is described. A reaction system is utilized in which the movable reaction producing mass is held motionless until movement of the craft being controlled is desired. To place the reactance system into operation, the reaction producing mass is first positioned so that the reaction forces generated when it is placed in motion will produce the desired movement in the craft. A stored source of energy is coupled to and released into the reaction producing mass, setting it in motion and causing the craft to rotate about the desired axes at a predetermined rate of movement. Once the craft has attained the desired attitude its rotational motion is arrested by stopping the movement of the reaction producing mass by coupling an energy storage system to the mass, which serves to extract and store all the kinetic energy contained within the mass. R.B.

N71-15642* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPACECRAFT ATTITUDE DETECTION SYSTEM BY STELLAR REFERENCE Patent
Irving B. Lowen and Marvin S. Maxwell, inventors (to NASA) Issued 6 Jan. 1970 (Filed 21 Oct. 1966) 9 p Cl. 250-203; Int. Cl. G01j1/20
(NASA-Case-XGS-03431; US-Patent-3,488,504; US-Patent-Appl-SN-588035) Avail: US Patent Office CSCL 17G

Two versions of a spacecraft attitude detection system are described. In one version, adapted for a three-axis control spacecraft, a reticle is mounted for constant rotation and a photodetector generates a signal for each star detected through the reticle. Signal processing circuits determine if the star is of acceptable magnitude, then generate appropriate signals indicative of star intensity and azimuth. In the other version, for use in a spin stabilized vehicle, the reticle is fixed, depending on vehicle rotation for its rotation. The spacecraft clock replaces the shaft-encoder to provide azimuth information. This information is used to determine the spacecraft attitude by equating the measurements with the known star background. Official Gazette of the U.S. Patent Office

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N71-14543# Naval Intelligence Command, Alexandria, Va. Translation Div.
ANALOG SIMULATION IN NUCLEAR POWER ENGINEERING
I. I. Sidorova 8 Oct. 1970 100 p refs Transl. into ENGLISH from the publ 'Analogovoye Modelirovaniye v Yadernoy Energetike' Moscow, Atomizdat. Publishing House, 1969 p 5–51, 102–109, and 126–158
(AD-713273; NIC-Trans-3123) Avail: NTIS CSCL 18/9

The book discusses the primary areas of nuclear power engineering where simulation methods are used, briefly presents the principles for the mathematical simulation of the basic problems, and cites the block diagrams and schematics of models used for calculations, experimental work, and operation of nuclear power plants. The book is intended to familiarize engineers, scientists, and students working in the nuclear power engineering field with the capabilities of simulation methods that are applicable to nuclear power plants. Author (TAB)

N71-14560# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
REACTOR OSIRIS: DESCRIPTIVE REPORT [REACTEUR OSIRIS: RAPPORT DESCRIPTIF]
Apr. 1970 232 p In FRENCH
(CEA-R-3984) Avail: AEC Depository Libraries

The OSIRIS swimming pool reactor has 70 MW thermal power. Its main purpose is irradiation of nuclear power station structural materials in high neutron flux. The general characteristics of the installation result from a technical choice for having in OSIRIS a reactor where there can be many irradiations in high flux. The installations which must not be changed (place, irradiation facilities, water circuits, control) and the core (fuel elements, neutron physics and thermal study) are described. For such a reactor, which must have a life of more than 10 years, it is possible to adapt to new programs. Details are given on the mode of functioning and the reactor operation after two years. Author (NSA)

N71-14627# Argonne National Lab., Ill.
SURVEILLANCE AND EVALUATION OF THE EBR-2 FLOW-MONITORING SYSTEM. EBR-2 PROJECT
R. O. Haroldsen, R. A. Cushman, L. J. Harrison, and S. M. Masters Apr. 1970 45 p refs
(Contract W-31-109-eng-38)
(ANL-EBR-18) Avail: NTIS

Because the many flow monitors active in the EBR-2 shutdown circuit have been a continuing source of spurious trips, a study was begun to determine whether the flow-monitoring system could be simplified without compromising reactor safety. A simultaneous failure of power to both primary pumps was hypothesized, and the resulting temperature transient in the reactor was simulated by using the THTB code in a computation by IBM-360 computer. Certain penalties were imposed on the computation to ensure conservative results. The results of the THTB calculation indicate a temperature margin of 50 F (below the 1300 F level at which the eutectic between the fuel and cladding begins to form) for a case in which the reactor scram was delayed 4 sec after power failure to the pumps. More realistic assumptions about reactivity feedback effects and initial conditions would result in a wider temperature margin. Author (NSA)

N71-14650# Oak Ridge National Lab., Tenn. Neutron Physics Div.
LMFBR SHIELDING DEVELOPMENT PROGRAM. PRELIMINARY EVALUATION OF TECHNIQUES FOR PREDICTING THE SPECTRA OF NEUTRONS TRANSMITTED BY GRID PLATE SHIELDS Interim Report
C. E. Clifford, F. R. Mynatt, and H. C. Claiborne 31 Jul. 1970 68 p refs
(Contract W-7405-eng-26)
(ORNL-TM-2896) Avail: NTIS

The status of the LMFBR shielding program in progress at Oak Ridge National Laboratory is described. The effort is mainly concerned with the evaluation and development of calculational techniques for predicting the fluence of neutrons that penetrate a sodium and stainless steel shield to reach the grid plate beneath the FFTF core. Experimental determinations of the spectra of neutrons transmitted through 12-in.- and 24-in.-thick shields of sodium, of iron, and iron pins plus sodium are compared with two-dimensional discrete ordinates calculations, and, in some cases, with Monte Carlo calculations of these spectra. Also presented are the results of a series of one-dimensional ANISN calculations made to evaluate the effect of material choice in an early FFTF configuration. On the basis of the studies completed to date, a number of conclusions are presented outlining the current situation regarding shielding design calculations of this nature. Author (NSA)

N71-14655# Oak Ridge National Lab., Tenn. Reactor Div.
POSTIRRADIATION EXAMINATION OF FUEL ELEMENT S-83 FROM CORE 2 OF THE ARMY SM-1 STATIONARY MEDIUM POWER REACTOR
V. O. Haynes and A. E. Richt Oct. 1970 53 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3081) Avail: NTIS

Stationary fuel element S-83 from Core II of the Army Stationary Medium-Power Reactor (SM-1) was examined to determine if the high-pH coolant water used during its service produced any observable effects different from those noted in examination of similar SM-1 Core 1 fuel elements (neutral-pH coolant water). Detailed nondestructive examinations, followed by destructive examinations of several of the fuel plates, indicate that the postirradiation condition of this element was similar to that observed for SM type elements previously examined. The oxide surface film on the fuel plates from fuel element S-83 appeared to be less uniform than the film observed on other SM-type fuel elements. Author (NSA)

N71-14663*# General Electric Co., Cincinnati, Ohio. Space Div.
DESIGN AND FABRICATION OF SNAP-8 AUXILIARY LOOP HEAT EXCHANGERS Final Report
E. S. Hsia and J. W. Zmurk [1970] 118 p refs
(Contract NAS3-13445)

(NASA-CR-72817; GESP-541) Avail: NTIS CSCL 18N

Analysis and design was performed for the SNAP-8 auxiliary loop heat exchanger. The heat exchanger will transfer 100 KW sub t and operate at a maximum temperature of 1300 F. A shell side pressure drop of 0.27 psi was achieved as a result of shell side flow model tests. The design incorporates a double containment feature such that no single containment wall failure will permit mixing of the flowing NaK streams. Two prototype heat exchangers were fabricated and delivered. Author

N71-14674# Oak Ridge National Lab., Tenn.
EVALUATING FUEL BEHAVIOR DURING IRRADIATION BY FISSION-GAS RELEASE
R. M. Carroll and O. Sisman Sep. 1970 30 p refs
(Contract W-7405-eng-26)
(ORNL-4601) Avail: NTIS

If a nuclear fuel is being irradiated where evolved fission gas can be measured, considerable information about the physical condition of the fuel can be obtained from observations of how the fission-gas release rate responds to different irradiation conditions of the fuel. The unchanging release of fission gas as burnup progresses can assure the experimenter that the fuel has not changed physical characteristics. Alternatively, a variable behavior of gas release rate can imply a cracking fuel, irradiation sintering of porosity, chemical reactions, grain growth, breakaway swelling, or surface changes. Author (NSA)

N71-14675# Oak Ridge National Lab., Tenn.
HIGH FLUX ISOTOPE REACTOR Quarterly Report, Apr.–Jun. 1970
R. V. McCord and B. L. Corbett 24 Sep. 1970 22 p Sponsored by AEC
(ORNL-TM-3162) Avail: NTIS

Operations and maintenance requirements are described. Test programs and experiments are reviewed. Design modifications are listed. NSA

N71-14690# Argonne National Lab., Ill.
DOCUMENTATION OF CRITICALITY DATA FOR EBR-2 WITH A STAINLESS STEEL RADIAL REFLECTOR: EBR-2 PROJECT
J. K. Long and W. R. Wallin Apr. 1970 63 p refs
(Contract W-31-109-eng-38)
(ANL-7541) Avail: NTIS

During 1967 and the first half of 1968, the EBR-2 reactor was operated with stainless steel subassemblies replacing its original depleted-uranium subassemblies in the inner two rows of the radial reflector. All data on the power coefficient of reactivity from the last run before the stainless steel substitution through the first runs for which depleted uranium was restored in this region are presented. Core-loading diagrams for all core configurations during this period are included. Reduced-flow studies were pursued to aid in distinguishing the fuel component from other components of the power coefficient of reactivity. A tabulation of the results of observations of slow periodic variations in power that occurred when the reactor was allowed to drift is presented. These slow variations only appeared when the stainless steel radial reflector was installed, and they disappeared when the depleted-uranium reflector was restored. Author (NSA)

N71-14714# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
ANALYTICAL CORRELATIONS OF: PRCF BATCH CORE FUELLED EXPERIMENTS
M. A. Mannan, Shojiro Matsuura, and D. L. Prezbindowski Jul. 1970 94 p refs
(Contract AT(45-1)-1830)
(BNWL-1453) Avail: NTIS

Three critical experiments containing 2 wt. % plutonium enriched fuel were performed in the Plutonium Recycle Critical Facility. These experiments were performed to provide information on physics characteristics of the batch core. Analytical correlations were made with the data from these experiments to test the accuracy of calculational methods in their application to plutonium enriched reactor cores. Two computational systems, HTH and HAMMER, were used in the study. Significant differences in HTH and HAMMER calculated results were noted. These differences result mainly from different epithermal cross-section libraries. The results of this study do not indicate a clear cut superiority of either HTH or HAMMER for plutonium fuelled cores. Author (NSA)

N71-14715# Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.
LMFBR LOW CAPACITY IHX DESIGN STUDIES SUPPORTING FFTF DEVELOPMENT. VOLUME 1: RESULTS, CONCLUSIONS, AND RECOMMENDATIONS
Jan. 1970 281 p refs
(Contract AT(30-1)-4112)
(WARD-4112-2-Vol-1) Avail: NTIS

Design studies were conducted which support development of a Na-to-Na intermediate heat exchanger (IHX) of general size, type, and performance characteristics to be used in the Fast Flux Test Facility (FFTF) project. Volume 1 includes background information, detailed summaries, conclusions, and recommendations resulting from the studies. Appendices present the concept selection report, the suggested in-place tube plugging procedures, the suggested tube bundle removal procedures, the recommended test programs, specifications, and drawings that were developed. NSA

N71-14716# Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.
LMFBR LOW-CAPACITY IHX DESIGN STUDIES SUPPORTING FFTF DEVELOPMENT. VOLUME 2: SUPPORTING CALCULATIONS
Jan. 1970 214 p refs
(Contract AT(30-1)-4112)
(WARD-4112-2-Vol-2) Avail: NTIS

A thermal and hydraulic performance analysis is presented for the Fast Flux Test Facility intermediate heat exchanger concept. Included are preliminary calculations on the major design and performance parameters, a preliminary stress analysis, and a preliminary vibration analysis. NSA

N71-14717# Oak Ridge National Lab., Tenn.
DEVELOPMENT OF FUEL AND COOLANT-SALT CENTRIFUGAL PUMPS FOR THE MOLTEN-SALT REACTOR EXPERIMENT
P. G. Smith Oct. 1970 50 p refs
(Contract W-7405-eng-26)
(ORNL-TM-2987) Avail: NTIS

The Molten-Salt Reactor Experiment (MSRE), a small nuclear power reactor that produced about 7 MW of heat while operating at approximately 1225 F and atmospheric pressure, requires a pump in each of two circulating molten-salt systems. A vertical centrifugal sump-type pump was developed for each system through water and molten-salt tests of prototype pumps at temperatures to 1400 F and hot shakedown operation of the actual reactor pumps before they were qualified for reactor service. The hydraulic performance of the pumps circulating molten salt corresponded closely with the performance obtained with water. The reactor pumps served well throughout the approximately 30,000-hr operating life of the MSRE, during which the reactor produced 105,737 MWht(t) of nuclear energy. A bootup pump, which contains additional volume in the pump tank to accommodate thermally expanded salt, was also fabricated and tested for the MSRE. Author (NSA)

N71-14718# Gulf General Atomic, San Diego, Calif.
REANALYSIS OF PLUTONIUM LATTICE SPECTRAL DATA Final Report, 1 Nov. 1969 – 30 Apr. 1970
J. M. Neill, P. d'Oultremont, and C. J. Rindfleisch 30 Jul. 1970 272 p refs Prepared for Battelle-Northwest Revised
(Contract AT(45-1)-1830)
(GA-10116-Rev) Avail: NTIS

Time-of-flight thermal neutron spectra measured at various positions and at different temperatures in H2O-moderated lattices of Al – Pu fuel are presented. Problems encountered in the experimental data and solutions applied are described. Trends in the revised experimental data and comparisons to theory are presented. NSA

N71-14731# Argonne National Lab., Ill.
PACKAGED LOOP FOR EBR-2: PRELIMINARY CONCEPTUAL-DESIGN STUDIES AND DISCUSSION OF POSSIBLE FUTURE WORK, EBR-2 PROJECT
Charles W. Wilkes, Ralph E. Rice, Jr., and Harold E. Adkins Dec. 1969 103 p refs
(Contract W-31-109-eng-38)
(ANL-7538) Avail: NTIS

A conceptual design of a packaged loop, which would be placed in one of the EBR-2 control-rod positions, has been developed. The loop would have its own closed-circuit coolant system, which would be isolated from the reactor coolant. The capability of such a loop for higher temperatures, isolation from the reactor coolant, containment of failures, and independent control of power density, coolant flow, and sodium chemistry would permit the performance of several types of experiments that could not normally be conducted in the reactor. Author (NSA)

N71-14732# Arizona Univ., Tucson. Dept. of Nuclear Engineering.
DYNAMICS OF A FAST REACTOR WITH IN-CORE THERMIONIC CONVERTERS Annual Report, 1 Sep. 1968 – 31 Aug. 1969
R. L. Brehm, D. L. Hetrick, D. A. Ferg, J. G. Guppy, K. D. Kearns et al Jun. 1970 126 p refs
(Contract AT(04-3)-670)
(TID-25528; AR-3) Avail: NTIS

The dynamics characteristics of fast in-core thermionic reactors are analyzed. Specific characteristics studied include: (1) effects of reactor coolant temperature changes on linear stability; (2) effects of nonlinear oscillations on stability of a two-region reactor; (3) oscillation boundaries in stable and unstable regions of a two-feedback reactor model; (4) stability analysis of reactor system models with time delay; (5) thermionic converter performance characteristics during startup; and (6) decoupling of multivariable control systems. NSA

N71-14733# Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Lab.
SRL EXPERIMENTS FOR THE JAPANESE POWER REACTOR AND NUCLEAR FUEL DEVELOPMENT CORPORATION
J. L. Jarriel and D. J. Pellarin Sep. 1970 71 p refs
(Contract AT(07-2)-1)
(DP-1219) Avail: NTIS

A set of experiments performed in the subcritical experiment (SE) and the process development pile (PDP) in support of the Japanese D2O power reactor program are described. The results of these experiments will be used by the Japanese in evaluating calculational techniques for the design of a prototype, boiling H2O-cooled, D2O-moderated advanced thermal reactor (ATR). The experiments were undertaken to determine control assembly worth, lattice bucklings, and detailed nuclear parameters. The measurements were made with D2O, H2O, and a H2O – D2O mixture in the coolant channels of the fuel assemblies, and at both 9- and 10-inch square lattice pitches, so that parameters for a variety of coolant conditions and lattice pitches of interest to the Japanese could be obtained by interpolation. The H2O – D2O mixture was used as a mockup of boiling H2O coolant in the ATR. Author (NSA)

N71-14795# Gulf General Atomic, San Diego, Calif.
FAST REACTOR SPECTRUM MEASUREMENTS Quarterly Progress Report, Period Ending 31 Jul. 1970
J. C. Young, P. d'Oultremont, G. M. Borgonovi, C. Rindfleisch, A. E. Profio et al 24 Aug. 1970 44 p refs
(Contract AT(04-3)-167,
(GA-10280) Avail: NTIS

The main effort was directed towards the following: (1) correction to STSF-1A analysis, (2) loading of STSF-7, (3) calculations for STSF-7, (4) cell calculation studies, (5) proton recoil detector studies, (6) He-3 neutron spectrometer studies, and (7) time dependent ANISN code. An improved data reduction for STSF-1A was made which modified the lower energy region of the neutron spectrum in this core. The STSF-7 core was loaded and reactivity calculations to verify the subcriticality of the system were performed as well as calculations necessary for comparison to the time-of-flight data. Difficulties in making cell calculations typical of fast reactors are discussed. Proton recoil response functions were measured for cylindrical hydrogen and methane detectors by time of flight. These detectors were also used to measure the neutron spectra in the core and the reflector of STSF-7. The time-dependent transport code ANISN was converted for use on the UNIVAC 1108 computer. Author

N71-14973# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
FLOODING PHENOMENON IN A CRYOGENIC HEAT PIPE WITH VERTICAL COUNTERCURRENT TWO-PHASE FLOW
Rolf Ewald, Albert Lacaze, and Paul Perroud 1970 14 p refs Presented at 3d Intern. Cryog. Engr. Conf., West Berlin, 25 – 27 May 1970
(CEA-CONF-1496; CONF-700522-1) Avail: AEC Depository Libraries

A vertical tube has been used to study experimentally the behavior of a vaporization-condensation cryogenic heat pipe, by analogy to the well-known heat pipe recently developd for higher temperatures. The flow in the vertical tube connecting the vaporizer to the condenser is countercurrent, the liquid flowing downwards as in annular film at the wall, while the vapor circulates upwards in the center. Experiments have been carried out in a glass apparatus using nitrogen, hydrogen, and deuterium boiling under medium pressures. The thermal power supplied to the boiler cell and the diameter of the vertical tube were varied until flooding occurred. A dimensional analysis permitting a good correlation of experimental results is presented. A comparison of the data with previous correlations established for other fluids at room temperature is also given. Author (NSA)

N71-15005# Argonne National Lab., Ill.
REACTOR PHYSICS DIVISION Annual Report, 1 Jul. 1968 – 30 Jun. 1969
Jan. 1970 542 p refs
(Contract W-31-109-ENG-38)
(ANL-7610) Avail: NTIS

Selected abstracts are presented on the following topics: (1) fission properties and cross section data, (2) fast reactor physics, (3) reactor safety, (4) experimental techniques and facilities, and (5) reactor computation methods and theory. NSA

N71-15016# Oak Ridge National Lab., Tenn. Isotopes Div.
ORNL ISOTOPIC POWER FUELS Quarterly Report, Period Ending 30 Jun. 1970

Eugene Lamb Sep. 1970 26 p refs
(Contract W-7405-eng-26)
(ORNL-4597) Avail: NTIS

The curium source test continued to operate at a temperature of approximately 1300 C on the fuel capsule and at a vacuum of approximately 0.007 torr in the primary vacuum chamber. The pressure and temperature of the helium of the curium reservoir were recorded for 67 days following assembly of the curium source to determine if the helium was being released quantitatively as the curium fuel decayed. Metallographic examination of two sets of Cm2O3 compatibility couples exposed for 10,000 hr at 1650 and 1850 C is complete. The effect of Gd2O3 on the phase change temperature of Cm2O3 is being studied. An adiabatic calorimeter is being assembled to measure the heat capacity of Cm2O3. Both nonradioactive and radioactive SrTiO3 compatibility couples are being exposed at temperatures of 900 and 1100 C for various times. The thermal conductivity of a hot-pressed 2.48-g Sr2TiO4 pellet was measured. High-pressure tests and temperature aging tests have been made on thin-walled SNAP-23 capsules and on heavy-walled threaded cap SNAP-23 capsules. Author (NSA)

N71-15031# Oak Ridge National Lab., Tenn.
ISOTOPE KILOWATT PROGRAM Quarterly Progress Report, Period Ending 30 Jun. 1970
Sep. 1970 28 p refs
(Contract W-7405-ENG-26)
(ORNL-TM-3099) Avail: NTIS

A heat block-shield design was developed that is suitable for all three power conversion systems under study. This unit has the further advantage that it can be used with either SrTiO3 or SrF2 fuel. A preliminary design for a reduced scale test loop to evaluate the thermal radiation stability characteristics of Dowtherm A was prepared and is being reviewed critically. A conceptual design of a heat pipe test was prepared, and preliminary arrangements for fabrication of a test unit were initiated. The design and construction of a full-scale thermoelectric module was considered and it was concluded that the principal problems associated with integrating the junctions into a complete heat pipe module assembly are much the same for lead telluride and the more efficient advanced material under development. Author (NSA)

N71-15038# McDonnell-Douglas Astronautics Co., Richland, Wash. Donald W. Douglas Labs.
PLUTONIA/CURIA COMPATIBILITY TESTING Quarterly Report, Apr.–Jun. 1970
R. L. Andelin and J. D. Watrous Jul. 1970 16 p
(Contract AT(45-1)-2138)
(MDG-G-1700; QR-7) Avail: NTIS

Continued comparative compatibility test results indicate that relatively pure plutonia-238 is less reactive with alloys of tungsten, rhenium, and molybdenum after exposure at 1800 and 2000 C than the original, less-pure plutonia. Improved compatibility is also exhibited by metallic specimens in contact with substoichiometric plutonia compared with stoichiometric PuO2. More oxygen appears to have been lost by the purer form of plutonia through container walls at 2000 C than was lost by the less-pure plutonia. Six refractory metal capsules containing curia-244 have completed exposure at 2000 C for 1,000 hours. Two additional sets of six capsules are undergoing exposure, one at 1,800 and one at 2,000 C. Plutonia-molybdenum cermets tested at 1,800 and 2,000 C have completed 5,000 hours exposure. Author (NSA)

N71-15039# Minnesota Mining and Mfg. Co., St. Paul, Minn. Electrical Products Group.
DEEP SEA RADIOISOTOPE-FUELED THERMOELECTRIC GENERATOR POWER SUPPLY SYSTEM, SNAP-21 PROGRAM, PHASE 2: 10-WATT SYSTEM Final Summary Report
F. Fox, R. Pannemann, and R. Wickenberg, eds. May 1970 389 p
(Contract AT(30-1)-3891)
(MMM-3691-62) Avail: NTIS

The SNAP-21 system is a radioisotope-fueled thermoelectric generator designed for deep sea applications. It functions by converting the heat from a decaying radioisotope fuel into useful electric energy. This heat energy is converted into electric energy by a thermoelectric generator. The isotopic fuel supplies heat to the thermoelectric materials and sea water acts as the heat sink to maintain the temperature gradient. Other components are employed to increase efficiency and condition the electric output to the desired form. The components performing these functions are enclosed in a pressure vessel which protects them from sea water pressure and exposure. No external inputs are required to maintain operation of the system. With this type of mechanically-static, unsupported operation, long life with no maintenance is achieved. Data and descriptions are presented on components of SNAP-21 including the heat source, shielding, insulation, thermoelectric generator, power conditioner, pressure vessel, electric receptacle, and generator mounting. Author (NSA)

N71-15040# Bhabha Atomic Research Centre, Bombay (India).
ESTIMATION OF PLUTONIUM BY CHEMICAL ANALYSIS
1970 39 p refs
(BARC-464) Avail: AEC Depository Libraries

A program of work on the standardization and application of some of the chemical methods for the accurate estimation of plutonium in PuO2 and similar materials was undertaken. By use of the coulometric and volumetric estimation methods and the potentiometric titration method more than 150 PuO2 samples were analyzed with a precision of better than 0.2%. The accuracy of the estimation methods was checked by using pure anhydrous Pu(SO4)2 as a primary standard. Author (NSA)

N71-15041# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
SODIUM TECHNOLOGY Quarterly Report, Apr.–Jun. 1970
W. R. Wykoff, ed. Aug. 1970 143 p refs
(Contract AT(45-1)-1830)
(BNWL-1200-4) Avail: NTIS

Topics investigated for sodium technology are: (1) design of liquid sodium corrosion loop; (2) development of cooling system and coolants for fast flux facility; (3) fuel element monitoring system failure analysis; (4) sodium induced corrosion and fission product transport; (5) stainless steel corrosion; (6) fabrication and performance of thorium oxide and yttrium oxide fuel elements. NSA

N71-15042# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
FFTF IRRADIATION TEST PROGRAM, PRELIMINARY
L. M. Finch, comp. Aug. 1970 106 p refs
(Contract AT(45-1)-1830)
(BNWL-1461) Avail: NTIS

A preliminary FFTF irradiation test program has been prepared as an initial definition of the first in-reactor irradiation experiments in the FTR. The general program description is appended with more detailed, but tentative, test plans. Appendices also compare the designed test capability against required test capability and evaluate the open test positions for tests and reactor performance optimization. Author (NSA)

N71-15043# Oak Ridge National Lab., Tenn.
MOLTEN-SALT REACTOR PROGRAM Semiannual Progress Report, Period Ending 28 Feb. 1970

Aug. 1970 361 p refs
(Contract W-7405-ENG-26)
(ORNL-4548) Avail: NTIS

Topics investigated in the molten salt reactor program include: (1) MSRE operations and development, (2) MSBR design and development; (3) chemistry; (4) materials development; and (5) molten salt processing and preparation. A separate abstract was prepared for each of the five sections. NSA

N71-15044# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
JUSTIFICATION AND SPECIFICATION FOR AN FTR OSCILLATOR
James R. Sheff Aug. 1970 39 p refs
(Contract AT(45-1)-1830)
(BNWL-1314) Avail: NTIS

The study and the conclusions of an investigation into the need for the measurement of the reactor transfer function of the Fast Test Reactor (FTR) are reviewed. A definition of how often the measurement should be made is presented. A study of the methods available for measuring such transfer functions is included. The methods are evaluated and the oscillator method was selected as the method most appropriate. Author (NSA)

N71-15045# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
EXPERIMENTAL AND CALCULATED RESULTS FOR UO2 AND UO2-PuO2 FUELED H2O-MODERATED LOADINGS
P. Loizzo, R. Martinelli, N. Pacilio, L. D. Williams, and J. B. Edgar Aug. 1970 22 p refs
(Contract AT(45-1)-1830)
(BNWL-1379) Avail: NTIS

Data collected during a series of experiments in the Plutonium Recycle Critical Facility (PRCF) using plutonium and uranium enriched fuel are presented. The experiments were designed to provide a base for assessing the accuracy of calculational techniques used for designing plutonium enriched cores in boiling water reactors with regard to predicting core reactivities, power distributions, and control system worths. Reactivity and power distribution measurements were made in both single region and multiregion loadings. Calorimetric techniques were used to intercalibrate the different fuel types for the multiregion loadings. The reactivity effect of various control blade materials was determined as a function of the prompt neutron decay rate. Author (NSA)

N71-15048# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
FABRICATION OF MARK 2 PROTOTYPIC FFTF FUEL SUBASSEMBLY FOR SODIUM FLOW TEST
R. L. Myers Jun. 1970 103 p refs
(Contract AT(45-1)-1830)
(BNWL-1418) Avail: NTIS

Fabrication of a prototypic model FFTF Mark 2 fuel subassembly is described. The subassembly is comprised of 217 fuel pins assembled into a hexagonal array with top and bottom grid arrangements holding the pin bundle inside a hexagonal flow duct. The pins are 0.230-in. diameter by 90 in. long and each is wrapped with a 0.056-in. diameter 20% cold work wire on a 12-in. pitch. All materials in the pin bundle in contact with sodium are of type 316 SS. The duct and nosepiece material is type 304 SS. Author (NSA)

N71-15047# General Electric Co., San Jose, Calif. Atomic Power Equipment Dept.
DEFICIENT COOLING Quarterly Progress Report, 1 Jan.–31 Mar. 1970
Apr. 1970 23 p
(Contract AT(04-3)-189)
(GEAP-10196) Avail: NTIS

Design of nonuniform axial flux heaters, and equipment and piping design for simultaneous sampling of three subchannels in the nine rod test section was completed and procurement initiated. Several one rod transient flow tests were performed and results recorded on magnetic tape. Two runs were made with the nine rod test section in which flow and enthalpy were measured in the side subchannel. Typical reactor grid spacers were used with 18-inch spacing with the last spacer four inches from the flow exit where samples were taken. Comparison of this preliminary data, with previous data taken without spacers, indicates the effect of the spacer is to increase flow in the corner and side subchannels and decrease flow in the center subchannel. This trend is in agreement with the distribution of spacer flow resistance in the three typical subchannels. Author (NSA)

N71-15071# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
INVESTIGATION OF MIXED OXIDE (25% PuO2 - 75% UO2) PROCESSING USING A NINE VARIABLE FRACTIONAL FACTORIAL EXPERIMENT
M. J. Barr, J. L. Jaech, and A. G. Anderson Jul. 1970 73 p refs
(Contract AT(45-1)-1830)
(BNWL-1445) Avail: NTIS

In addition to an evaluation of variables associated with each unit operation, a fractional factorial experiment was designed to show variable effects and interactions that occur in the process as a whole. The experiment involves nine key process variables including: calcination temperature of PuO2, preslugging pressure, pressing pressure, binder type, binder percentage, percent addition of sintered recycle powder, particle size of sintered recycle powder, sintering time, and sintering temperature. The measured dependent variables were green density, sintered density, sorbed gas, percent shrinkage and uniformity of diameter, and sintered density. Author (NSA)

N71-15072# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
COBRA-2A: A PROGRAM FOR THERMAL-HYDRAULIC ANALYSIS IN VERY LARGE BUNDLES OF FUEL PINS
C. L. Wheeler, G. C. Main, and D. C. Kolesar Aug. 1970 99 p refs
(Contract AT(45-1)-1830)
(BNWL-1422) Avail: NTIS

This program is an extension of the COBRA 2 code written for rod bundle subchannel analysis involving steady-state single or two-phase flow. The basic method of calculation used in COBRA has been retained. With a finite difference solution obtained at each axial node. Typically, the volume the axial node approximates is the entire subchannel of incremental depth. An extensive set of refinements has been made to the COBRA 2 code to allow analysis of very much larger bundles of rods, with significantly less complex input and several model additions, including the effects of rotating spacer wires. Those features which differ from the COBRA 2 code are described in some detail. Program documentation and input instructions, as well as sample problems, are provided. Author (NSA)

N71-15076# Skoda Works, Pilsen (Czechoslovakia). Nuclear Power Plants Div.
COMPARISON OF ULTRASONIC FINDING WITH ACTUAL DEFECTS
J. Prepechal 1970 17 p refs
(ZJE-83) Avail: AEC Depository Libraries

The relation between an ultrasonic indication obtained by ultrasonic inspection and the actual characteristics of defects is discussed. The precision and reliability of the inspection and the relation between the equivalent and actual area of a defect were investigated for the defects in a forging of Al-Mg-Si alloy. Author (NSA)

N71-15077# Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.
OXIDE FUEL ELEMENT DEVELOPMENT Quarterly Progress Report, Period Ending 31 Mar. 1970
Jul. 1970 159 p refs
(Contract AT(30-1)-4135)
(WARD-4135-8) Avail: NTIS

Research results are summarized on fuel performance analytical methods, development of codes for performance of mixed oxide fuel rods, mixed oxide fuel pin irradiation, mixed oxide grid assembly irradiation, fuel pin design, fabrication of EBR-2 fuel assemblies, subassembly design, pellet fabrication, fuel characterization, quality control, and fuel assembly fabrication. NSA

N71-15078# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
CHARACTERIZATION OF SOME UO2 AND PuO2 POWDERS
M. J. Barr, M. W. Urie, J. L. Daniel, and S. J. Mayhan Jul. 1970 39 p
(Contract AT(45-1)-1830)
(BNWL-1441) Avail: NTIS

The physical characteristics of UO2 and PuO2 powders as determined by B. E. T. Surface area, M. S. A. particle size and distribution, and scanning electron micrographs are discussed. Powders evaluated include: two commercially produced UO2 powders, oxalate and nitrate source PuO2, and burned Pu metal. In addition, oxalate source PuO2 was calcined at various temperatures to modify the particle properties. The experimental work is believed to be one of the first examples of using a scanning electron microscope to explain the problems associated with physical property measurement of fine powders. Author (NSA)

N71-15079# General Electric Co., Pleasanton, Calif. Nucleonics Lab.
A THERMODYNAMIC DATA PROGRAM INVOLVING PLUTONIA AND URANIA AT HIGH TEMPERATURES Quarterly Report, 1 Feb. –30 Apr. 1970
E. A. Aitken and S. K. Evans Jul. 1970 15 p refs
(Contract AT(04-3)-189)
(GEAP-12089; QR-11) Avail: NTIS

Research results are reported on vaporization of UO2, distribution of O in UO2 – PuO2 ceramics, thermodynamics of sodium-fuel reaction product behavior, and O equilibria in UO2–PuO2. NSA

N71-15087# Atomic Energy Board, Pretoria (South Africa).
REACTOR THERMAL POWER INTEGRATOR FOR SAFEGUARDS CONTROL
D. J. Sligting and W. H. Du Preez Oct. 1969 31 p
(Contract IAEA-576/RB)
(PEL-200) Avail: AEC Depository Libraries

An instrument which computes and periodically records the integrated thermal power of a water cooled nuclear reactor over an extended period of time for safeguards control purposes is described. Various philosophical aspects of safeguards control are discussed together with practical problems of implementing an ideal system. The discussion leads to the reasons for adopting the approach used, which involves the use of existing transmitters in the safety channels of the reactor as signal sources for the power integrator. The power integrator accepts standard signals for both Delta tau and the coolant flow and, from these variables, computes the time integral of the reactor power. It also provides printout of integrated power at 24 hour intervals; is capable of unattended operation for at least six months, will not lose information during a power failure, and is completely independent and tamper proof after being sealed. A complete operating and service manual for the instrument is included. Author (NSA)

N71-15088# Deutsches Elektronen-Synchrotron, Hamburg (West Germany).
A COMPARISON OF HEALTH PHYSICS MEASURING PROCEDURES AT ACCELERATORS
E. Freytag and D. Nachtigall (EURATOM, Geel, Belgium) Jun. 1970 14 p refs
(DESY-70127) Avail: AEC Depository Libraries

A tabular summary of the different measuring procedures and instruments used for radiation dosimetry at 23 accelerator centers in Japan, North America, and Western Europe is presented. The lists contain 42 different procedures and instruments. NSA

N71-15089# Skoda Works, Pilsen (Czechoslovakia). Nuclear Power Plants Div.
SYSTEM OF CONTROL OF A-1 NUCLEAR REACTOR WITH MOVING CHAMBERS (MC SYSTEM)
F. Drab, L. Heniger, and J. Teska 1970 14 p refs
(ZJE-79) Avail: AEC Depository Libraries

The theoretical principle of the moving chamber control system developed in Czechoslovakia is discussed. The individual parts and functions are described. Author (NSA)

N71-15090# Skoda Works, Pilsen (Czechoslovakia). Nuclear Power Plants Div.
CALORIMETRIC MEASUREMENTS IN NUCLEAR ENGINEERING
J. Kott, S. Teren, and V. Jirousek 1970 6 p
(ZJE-84) Avail: AEC Depository Libraries

Information concerning the use of calorimeters developed for measurement of gamma radiation intensity is presented. This information is of great importance in the case of reactor structural materials, the heating of which, due to radiation, may deserve serious consideration. Author (NSA)

N71-15106# Oak Ridge National Lab., Tenn. Reactor Chemistry Div.
BEHAVIOR OF IODINE IN ZIRCALOY CAPSULES
Horst Feuerstein Aug. 1970 37 p refs
(Contract W-7405-eng-26)
(ORNL-4543) Avail: NTIS

The behavior of iodine in Zircaloy capsules under conditions similar to those on the inner cladding surface of a fuel rod in water cooled reactors was investigated. The thermodynamic equilibrium in the system was attained over the following reaction chain: chemisorption of the iodine on the metal surface, reaction of the chemisorbed iodine with the metal to form ZrI4, chemisorption of the ZrI4 on the metal surface, and reaction of the chemisorbed ZrI4 with the metal to form lower iodides. For equilibrium conditions the experimental results do not agree with thermodynamic calculations. The results can be explained by assuming different intermediate phases of zirconium iodides at different temperatures. Author (NSA)

N71-15108# Skoda Works, Pilsen (Czechoslovakia). Nuclear Power Plant Div.
PROBLEMS OF MANUFACTURE AND WELDING OF STRUCTURAL EQUIPMENT OF AUSTENITIC STEELS FOR NUCLEAR REACTORS
J. Halabuda, Z. Masek, K. Matejovic, and B. Tosovsky 1970

13 p refs
(ZJE-81) AEC Depository Libraries

Aspects of austenitic steel fabrication equipment for nuclear reactors are discussed. The possibilities of production of austenitic steels in the CSSR are outlined, particular reference is made to the possibility of effectively producing exceptionally large ingots not produced in the CSSR up to the present, data are quoted of the isotropy of the mechanical properties of plates 100 mm thick, the influence of neutron radiation on the mechanical properties is mentioned and the problem of heat treatment of weldments is studied. Exceptional attention is devoted to the problems of welding. Matters presented in particular are the resulting findings, gained experience, and the method used in the welding of the supporting cylinder for the first Czechoslovak nuclear reactor which is a large size body with walls 25 to 120 mm thick, with which so far no manufacturer in the CSSR had any experience. Author (NSA)

N71-15110# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
HAZARDS ANALYSIS FOR THE BATTELLE-NORTHWEST EBR-2/TREAT TRANSIENT IRRADIATION TEST SERIES
G. E. Culley and D. O. Sheppard Jun. 1970 82 p refs
(Contract AT(45-1)-1830)
(BNWL-1368) Avail: NTIS

The experimental equipment used and analysis of potential hazards involved in the EBR-2/TREAT series of transient irradiations to be conducted in support of the Fast Flux Test Facility (FFTF) fuel development program are reported. Approximately sixteen transient irradiations in TREAT will be conducted on prototypic FFTF fuel pins previously irradiated in EBR-2 to burnups of 10,000 to 50,000 MWd/mtm. A hazards analysis was conducted on the maximum burnup fuel pin for both the expected and maximum accident transient conditions. Author (NSA)

N71-15113# Bettis Atomic Power Lab., Pittsburgh, Pa.
ON-LINE SOLID-STATE REACTIVITY COMPUTER FOR REACTOR PHYSICS TESTING
D. J. Miller and W. A. Shaughnessy Aug. 1970 51 p refs
(Contract AT(11-1)-Gen-14)
(WAPD-TM-896) Avail: NTIS

Reactivity changes in a nuclear reactor from the near critical condition can be measured both more accurately and more quickly by a reactivity meter than by period measurement techniques. The inverse kinetics simulator (IKS) is a small analog computer which supplies time-dependent reactivity data from an input signal directly proportional to reactor power (i.e., ion chamber current). This device has been developed and used in conjunction with reactor test programs. During these tests, its ability to give fast, accurate, reactivity data was demonstrated. Author (NSA)

N71-15114# California Univ., Livermore. Lawrence Radiation Lab.
SOME ENGINEERING ASPECTS OF AN ASTRON FUSION POWER REACTOR SYSTEM
J. D. Lee, R. W. Werner, B. Myers, P. B. Mohr, G. A. Carlson et al 15 Aug. 1970 8 p refs Presented at Energy 70, The Intersoc. Energy Conversion Eng. Conf., Las Vegas, Nev., 21–25 Sep. 1970 Submitted for publication Sponsored by AEC
(UCRL-72336; Conf-700912-2) Avail: NTIS

Described here are engineering aspects of an updated version of an Astron power reactor. In addition to a general description, structural design, neutronics, heat transfer, and costs are discussed. The reacting deuterium-tritium plasma (D + T yields He-4 + n+ 17.6 MeV) is contained by the field pattern of closed magnetic lines unique to the Astron system. The neutronic calculations examine the trade-offs between tritium breeding and energy generation while including the influence of structural design and heat transfer requirements. The blanket is a niobium structure of modular design operating at a maximum temperature of 1150 K. A modular design of the blanket permits fabrication economies and allows for replacement of a relatively low-cost structural shell on a time schedule matched to radiation damage. Author (NSA)

N71-15162*# Westinghouse Electric Corp., Large, Pa. Astronuclear Lab.
NUCLEAR ROCKET SHIELDING METHODS, MODIFICATION, UPDATING, AND INPUT DATA PREPARATION. VOLUME 1: SYNOPSIS OF METHODS AND RESULTS OF ANALYSIS Final Progress Report
R. G. Soltesz, R. K. Disney, R. S. Kaiser, J. Jedruch, and S. L. Zeigler Aug. 1970 98 p refs
(Contract NAS8-24919)
(NASA-CR-102964; WANL-PR-(LL)-034-Vol-1) Avail: NTIS CSCL 18F

The material presented includes the following sections: (1) use of the MSFC complete code package with descriptions of the preliminary or parametric design method and the detailed design method; (2) nuclear shielding methods and master library data with descriptions of the computer codes and master library files; and (3) evaluation and calculations with a presentation of selected results using the code package. Author

N71-15163*# Westinghouse Electric Corp., Large, Pa. Astronuclear Lab.
NUCLEAR ROCKET SHIELDING METHODS, MODIFICATION, UPDATING, AND INPUT DATA PREPARATION. VOLUME 2: COMPILATION OF NEUTRON AND PHOTON CROSS SECTION DATA Final Progress Report
R. G. Soltesz, R. S. Kaiser, and R. K. Disney Aug. 1970 130 p refs
(Contract NAS8-24919)
(NASA-CR-102965; WANL-PR-(LL)-034-Vol-2) Avail: NTIS CSCL 18F

The compilation and preparation of neutron and photon cross section data are described with the material being subdivided into the following categories: (1) neutron cross sections for the ANISN-W DOT-2W discrete ordinates transport codes and their auxiliary codes; (2) photon cross sections for the ANISN-W and DOT-2W discrete ordinates transport codes, KAP-6 point kernel code, and the SCAP single- and albedo-scatter code; (3) preparation of multigroup cross section sets (with upscatter removed, if desired), using a modified version of the ANISN code or the APPROPOS cross section preparation code; and (4) basic, nuclear data for nuclear and radiation analysis of a nuclear system. Author

N71-15164*# Westinghouse Electric Corp., Large, Pa. Astronuclear Lab.
NUCLEAR ROCKET SHIELDING METHODS, MODIFICATION, UPDATING, AND INPUT DATA PREPARATION. VOLUME 3: CROSS SECTION GENERATION AND DATA PROCESSING TECHNIQUES Final Progress Report
R. G. Soltes, R. K. Disney, and S. L. Zeigler Aug. 1970 419 p refs
(Contract NAS8-24919)
(NASA-CR-102966; WANL-PR-(LL)-034-Vol-3) Avail: NTIS CSCL 18F

A description of the cross section generation and data processing techniques for analyzing nuclear reactor systems is given. These techniques include: (1) the GAMLEG-W code for generating multigroup photon cross sections for use in discrete ordinate and Monte Carlo transport codes; (2) the APPROPOS code for preparing multigroup, simultaneous, neutron-photon cross section data and neutron reaction cross section data for radiation transport codes; (3) the NAGS code for processing the output fluxes from one- and two-dimensional discrete ordinate transport codes to provide neutron and gamma ray distributed source data as well as nuclear energy deposition; and (4) the SATURN code for processing

master library cross section data including optional transverse leakage corrections, adjoint reversals, and mixture operations. Detailed user information is supplied for each code. This information includes problem setup, running time, required input data, and tape and core storage requirements. A sample problem card input and printout as well as a description of printed, punched and tape output is included for each code. Author

N71-15165*# Westinghouse Electric Corp., Large, Pa. Astronuclear Lab.
NUCLEAR ROCKET SHIELDING METHODS, MODIFICATION, UPDATING, AND INPUT DATA PREPARATION. VOLUME 4: ONE-DIMENSIONAL, DISCRETE ORDINATES TRANSPORT TECHNIQUE Final Progress Report
R. G. Soltesz and R. K. Disney Aug. 1970 103 p refs
(Contract NAS8-24919)
(NASA-CR-102967; WANL-PR-(LL)-034-Vol-4) Avail: NTIS CSCL 18F

The proposed version of the ANISN computer code for solving the one-dimensional, energy dependent, linear Boltzmann transport equation with general anisotropic scattering is described. The major improvements of the ANISN-W code over the ANISN code are: (1) the inclusion of automated tape linkage of input and output data, and (2) the capability to input a distributed or shell source from cards and/or from tape. Detailed user information including problem setup, running time, boundary conditions, quadrature data, and mesh spacing requirements is described. In addition, requirements for cross section weighting, search calculations, activities, and stacked problems are given. Typical problem setup information is supplied as well as a description of the printed output. A sample problem card input and printout are included. Author

N71-15166*# Westinghouse Electric Corp., Large, Pa. Astronuclear Lab.
NUCLEAR ROCKET SHIELDING METHODS, MODIFICATION, UPDATING, AND INPUT DATA PREPARATION. VOLUME 5: TWO-DIMENSIONAL, DISCRETE ORDINATES TRANSPORT TECHNIQUE Final Progress Report
R. G. Soltesz, R. K. Disney, J. Jedruch, and S. L. Zeigler Aug. 1970 426 p refs
(Contract NAS8-24919)
(NASA-CR-102968; WANL-PR-(LL)-034-Vol-5) Avail: NTIS CSCL 18F

The proposed version of the DOT computer code for solving the two-dimensional, energy dependent, linear Boltzmann transport equation with general anisotropic scattering, and the MAP computer code for solving for the anular, spatial, and energy dependent flux external to a nuclear system are described. The major improvements of the DOT-2W code over the DOT code are the inclusion of acceleration techniques on the group flux solution, improved convergence logic, asymmetric quadrature capability, and improved tape operations. Detailed user information involving problem setup, running time, quadrature data, and mesh spacing requirements is described for both codes. In addition, requirements for eigenvalue, fixed volume distributed source, boundary source, and search calculations are given for the DOT-2 code. Typical problem setup information is supplied for both codes as well as a description of the printed output. A sample problem card input and printout are included for each code. The appendix describes the DOQ and ADOQ quadrature coefficient calculation codes. Author

N71-15167*# Westinghouse Electric Corp., Large, Pa. Astronuclear Lab.
NUCLEAR ROCKET SHIELDING METHODS, MODIFICATION, UPDATING, AND INPUT DATA PREPARATION. VOLUME 6: POINT KERNEL TECHNIQUES Final Progress Report
R. K. Disney Aug. 1970 288 p refs
(Contract NAS8-24919)
(NASA-CR-102969; WANL-PR-(LL-034-Vol-6) Avail: NTIS CSCL 18F

The KAP 6 computer code for solving energy dependent radiation transport external to a radiation source is described. KAP 6 is a revised version of the KAP 5 code and is written in standard USASI FORTRAN 4. Revisions include the data input interface with the GAMLEG-W and NAGS code, as well as options to preferentially exclude multiple scatter buildup approximations in certain zones. The KAP 6 (Point Kernel Attenuation Program) code employs the point kernel method to calculate neutron and gamma ray radiation levels at detector points located within or outside a complex geometry describable by a combination of quadratic surfaces. The attenuation function, or kernel, for gamma rays employs exponential attenuation along with a buildup factor to account for multiple scales. Three optional fast neutron attenuation functions are included: (1) a modified Albert–Welton function for calculating fast neutron dose rate using removal cross sections; (2) a bivariant polynomial expression for computing neutron spectra using infinite media moment data; and (3) a monovariant polynomial expression for computing neutron spectra using infinite media moments data. The code also handles either cylindrical, spherical, disc, line, or point sources. A variety of options are available for describing neutron or gamma ray source distributions in complex geometries. Author

N71-15210# Babcock and Wilcox Co., Lynchburg, Va. Research and Development Div.
GEL-ADDITION PROCESS CHEMICAL STUDIES Quarterly Progress Report, May–Jul. 1970
R. V. Carlson, comp. Sep. 1970 24 p refs
(Contract AT(30-1)-3714)
(BAW-3714-16; QPR-16) Avail: NTIS

Seven pellet, seven vipac, and seven sphere-pac pins containing UO2-235-20% PuO2 were prepared for the unencapsulated bundle to be irradiated in the EBR-2. These are sufficient for the initial loading. All the pins were Xe-tagged and welded, and the final inspection is in progress. The final five capsules scheduled in the time-for-restructuring series were irradiated in the BAWTR. Four capsules were irradiated simultaneously for 30 days, one each at 6, 10, 15, and 20 kW/ft. Another capsule was irradiated for 8 hours at 20 kW/ft. Nine of the BAWTR capsules disassembled in the BSW hot cell facility. No abnormalities were observed in the visual examination or gamma scans of the 27 pins contained in the nine capsules. Author (NSA)

N71-15211# Allis-Chalmers Mfg. Co., Bethesda, Md. Atomic Energy Div.
INVESTIGATION OF PITTING CORROSION ON THE MALCOMIZED STAINLESS STEEL CONTROL ROD PUSH RODS IN THE LA CROSSE BOILING WATER REACTOR
Jul. 1970 61 p refs
(Contract AT(11-1)-850)
(ACNP-70502) Avail: NTIS

Detailed visual and photographic examinations of the surface of malcomized push rod from CRD No. 27 are described. A static corrosion test on specimens of Type 304 stainless steel identical to the CRD push rods is reviewed. Results from the surveillance program and the corrosion test are presented. NSA

N71-15215# Union Carbide Corp., Oak Ridge, Tenn.
SOUTHERN AREA RESEARCH AND DEVELOPMENT SAFETY SYMPOSIUM
1969 160 p refs Conf. held at Oak Ridge, Tenn., 28–29 Apr. 1969 Sponsored by AEC
(CONF-690441) Avail: NTIS

These proceedings contain eleven papers dealing with the following topics: combating laboratory fires, industrial hygiene in

a research oriented facility, the safety environment at the ZGS complex, engineering for hospital safety, engineering design as a safety control for advanced research projects, determination of flammability and explosive limits, safety in AEC research and development activities, high energy storage system safety in research and development, safe handling of fluorine, handling and use of cryogenics, and unusual and unexpected radiation sources. NSA

N71-15227# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
A DETAILED PHYSICO-CHEMICAL STUDY OF ZnCl2-BASED BINARY MOLTEN SALT SYSTEMS Progress Report
C. Austen Angell Aug. 1970 29 p refs
(Contract AT(11-1)-2008)
(COO-2008-3) Avail: NTIS

The overall purpose of the program is the study of the properties of ionic liquids over the maximum possible temperature range with special emphasis on extending the range of experimentation downwards in temperature toward the low temperature limit set by the glass transition phenomenon. This emphasis has restricted the systems of study, and most of the work has been performed on systems containing zinc chloride as one component. It was initially expected that these systems would provide interesting analogues of the BeF2-based molten salt solutions serving as fuel carrier and coolant in the molten salt reactor and work to date has shown this to be very much the case. Author

N71-15242# California Univ., Livermore. Lawrence Radiation Lab.
SOME ECONOMIC ASPECTS OF POWER CONVERSION FOR FUSION REACTORS
P. B. Mohr 15 Sept. 1970 8 p refs Presented at the 'Energy 70' IECEC Conf., Las Vegas, Nev., 21-25 Sep. 1970 Sponsored by AEC
(UCRL-72349; Conf-700912-3) Avail: NTIS

It is considered how increased conversion efficiency made possible by advances in materials, direct conversion and thermodynamic technology may be utilized to offset both fixed and variable costs. Thermonuclear reactors produce power in the form of both neutral and energetic charged particles. Using present power costs as a base, one finds thermodynamic conversion of the energy of neutral particles to be adequate to support internal power requirements as great as 25% of the fusion power, providing capital cost per marketable kilowatt for the entire system is not more than one and one-half to two times that of current fossile fuel systems. On the same basis, the direct conversion of energetic charged particles at high (> 90%) efficiency would allow circulation of internal power approaching the same order as the fusion power. For lesser internal power requirements, high injection and recovery efficiency would allow normalized capital costs from two to three times present values, or, alternatively, power costs could be substantially reduced. Author (NSA)

N71-15243# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).
INVESTIGATIONS OF FLUX DISTRIBUTIONS AND REACTIVITY EFFECTS IN HIFAR USING TWO-DIMENSIONAL MODELS
D. Culley Mar. 1970 48 p refs
(AAEC/TM-533) Avail: AEC Depository Libraries

An attempt has been made to represent the reactor HIFAR using the diffusion code CRAM. The variation of neutron flux across core and reflector, and the effect of course control arm angle on safety rod worth and core excess reactivity, have been investigated using a model in R-Z geometry. Comparisons with operational data have been made. Flux distributions within the core and the effects of rigs and partially burnt fuel elements have been studied in greater detail using an X-Y geometry representation of the reactor. Author (NSA)

N71-15244# IIT Research Inst., Chicago, Ill.
DEVELOPMENT OF NEUTRON SPECTROMETRY FOR CRITICAL FACILITIES Final Report, 1 Oct. 1968 - 31 Mar. 1970
R. A. Semmler May 1970 83 p refs
(Contract AT(11-1)-578)
(IITRI-578-P-33-18) Avail: NTIS

The development of a wall-less proton-recoil proportional detector for neutron spectroscopy in critical assemblies is described. Topics include the electronic system, detector characteristics, program for data reduction, neutron flux measurements in the ATSR, combining the wall-less detector and pulse-shape discrimination techniques, and detector deficiencies. Gamma rejection, energy calibration, pileup rejection, and the geometrical efficiency of a cylindrical wall-less proportional detector are discussed. NSA

N71-15247# California Univ., Berkeley. Lawrence Radiation Lab.
STRUCTURAL EFFECTS OF NIOBIUM ION BOMBARDMENT OF NIOBIUM FOILS Progress Report
P. B. Mohr, B. Myers, and W. Brunner 16 Sep. 1970 7 p refs Presented at 5th Ann. Intersoc. Energy Conversion Eng. Conf., Las Vegas, Nev., 21-25 Sep. 1970 Submitted for publication Sponsored by AEC
(UCRL-72408; Conf-700912-4) Avail: NTIS

The effects which 14 MeV neutron radiation likely to have on the engineering properties of thermonuclear reactor materials are examined. The damage mechanisms associated with fusion neutron irradiations with particular emphasis on their effect on reactor operating temperatures and service lifetimes are enumerated and compared. Difficulty is anticipated in attaining the required fluence of 14 MeV neutrons for radiation effects testing prior to the existence of the reactors themselves. This leads to consideration of other means for experimental simulation of the desired effects. An approach to simulation based on the bombardment and simultaneous testing of thin foils is favored. Such a program of evaluation has been initiated. An assessment is given of the surface physics complications which are believed to be present. The technology for the creation of representative thin foils is discussed and an outline for in-situ creep testing is presented. Author (NSA)

N71-15248# Oak Ridge National Lab., Tenn.
THORIUM FUEL CYCLE DEVELOPMENT Progress Report
Sep. 1970 18 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3124; PR-13) Avail: NTIS

Progress is reported on head-end processing development, refabrication development, TURF equipment design and engineering and materials irradiation. NSA

N71-15264# Rensselaer Polytechnic Inst., Troy, N.Y.
LINEAR ACCELERATOR PROJECT Progress Report, 1 Jan. - 31 Mar. 1970
31 Mar. 1970 86 p refs
(Contract AT(30-1)-328)
(RPI-328-187) Avail: NTIS

Research progress is reported on: capture and transmission measurements on V, Ni-60, Cr-50, Cr-52, Cr-53, and Cr-54; keV neutron capture measurements on Pu-240; transmission measurements on Pu-240; normalization of U-235 resonance to thermal antineutrino; 250-m neutron time-of-flight facility; neutron monitor for time-of-flight experiments; neutron average transmission and self-indication ratio measurements on Ta at room temperature; U-235 fission cross section; interactive transmission shape-fitting code for the IBM 1130; fast neutron spectra in Al; sodium assembly for fast neutron spectrum measurements; space-, time-, and energy dependent neutron spectra calculations; fast reactor physics and engineering; instrumentation development; and systematics of photoneutron spectra. NSA

N71-15572# Oak Ridge National Lab., Tenn.
PROCEEDINGS OF THE GAS-COOLED REACTOR INFORMATION MEETING
1970 937 p refs Conf. held at Oak Ridge, Tenn., 27–30 Apr. 1970 Sponsored by AEC
(CONF-700401) Avail: NTIS HC$10.00/MF$0.65

The conference on helium cooled high temperature reactor development, design concepts, and operating experience is reported. Major emphasis is on the HTGR converter using graphite for the fuel structure and moderator. Gas cooled fast breeder reactor concepts using metallic-clad mixed oxide fuel pins are also discussed. NSA

N71-15574# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Heisse Chemie.
PRELIMINARY STUDY OF THE CHOPPER FOR COMPLETE FUEL ELEMENTS BUNDLES OF THE SNR-Na2 IN THE WAK [EVORSTUDIE UEBER DAS ABSCHEREN GANZER BRENNELEMENT BUENDEL DES SNR-Na2 IN DER WAK]
B. F. Roth and H. Becker Dec. 1969 45 p refs In GERMAN; ENGLISH summary
(NP-18451) Avail: AEC Depository Libraries

Literature and experimental tests show, there are no fundamental problems to solve in the fabrication of a chopper for complete fuel elements. In building a chopper for bigger fast breeder fuel elements for the sake of experience, it seems to be sensible to assemble and build a chopper with a prototype scissor for SNR Na2 fuel elements although the main arguments for a multiple chopper such as bigger output, is not yet valid. The output for a prototype chopper for closed fuel cycles of SNR Na2 system was calculated as an example. This output depends on the fuel reprocessing and refabrication capacity. Author (NSA)

N71-15587# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Angewandte Reaktorphysik.
IN-PILE CREEP BEHAVIOR OF SEVERAL AUSTENITIC STEELS AND NICKEL ALLOYS UNDER MULTIAXIAL LOAD
K. D. Closs and H. J. Laue Dec. 1969 52 p refs In GERMAN
(KFK-1152) Avail: AEC Depository Libraries

Tubes with an outer diameter of 7 mm, a wall thickness of 0.4 mm and a length of 45 mm were irradiated in the Belgian Reactor BR 2 at temperatures of 600, 650, and 700 C to determine the stress-rupture strength and the rupture-strain of these specimens. The maximum irradiation time was 4757 hr. The austenitic stainless steels and Ni-alloys examined include the German steels X8CrNiMoV Nb 1613 and X2CrNi 2025, Incoloy 800, Inconel 625, Hastelloy X, Inconel 718, and Inconel X 750. The decrease of the stress-rupture-strength caused by the irradiation was between 15% and 55% depending on the irradiation temperature and the materials used. The rupture-strain of the tested alloys was drastically reduced by the irradiation. This was attributed to the high temperature embrittlement by (n,alpha)-reactions. All alloys except Incoloy 800 and Hastelloy X showed rupture-strains less than 1% for at least one test temperature. Author (NSA)

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics; 20 Meteorology; and 29 Space Radiation.

N71-14505# Naval Underwater Systems Center, New London, Conn.
AN EXPERIMENTAL MODEL STUDY OF UNDERWATER ACOUSTIC SCATTERING FROM A WIND-DRIVEN SURFACE
F. John Kingsbury (Ph.D. Thesis) 13 Aug. 1970 375 p refs
(AD-713068; NUSC/NL-3021) Avail: NTIS CSCL 20/1

The results of an experimental investigation into the characteristics of acoustic energy reflected from rough, time-varying surfaces are presented. Theory pertinent to the study of acoustic scattering is also presented to form a predictive base for the experimental work. The experimentally derived amplitude, slope, spectral, and spatial correlation characteristics of the rough surfaces are presented. Measurement results are shown which describe the spatial distribution characteristics of energy scattered from the rough surfaces. Experiments performed to determine the modulation effects imposed on the reflected acoustic energy by the time-varying surfaces are also presented. For all the measurements, the effects on the scattered energy characteristics of shadowing and changes in acoustic frequency, grazing angle, and the direction of acoustic propagation relative to the wave motion are discussed. Author (TAB)

N71-14647*# Washington Univ., Seattle.
ON INDUCED BIREFRINGENCE IN VISCOELASTIC MATERIALS
Bernard D. Coleman (Carnegie-Mellon Univ.) and Ellis H. Dill Washington NASA Jan. 1971 89 p refs
(Grant NGR-48-002-003; Contract AF 49(638)-541; Grant AF-AFOSR-1538-68)
(NASA-CR-1703) Avail: NTIS CSCL 20K

A theoretical framework is provided for the description of induced birefringence in materials with long-range memory. The basic constitutive assumptions are that the stress and dielectric properties are given by functions of the history of the strain; no assumptions of linearity or smoothness are made for these constitutive functionals. The consequences of material symmetry and frame-indifference are examined in detail, and reduced forms of the constitutive equations are given for several classes of motions of isotropic materials. Among the motions studied are those locally equivalent to extensions, shears, and sheared extensions. Several optical experiments are suggested. Author

N71-14648# Royal Aircraft Establishment, Farnborough (England).
THE MAXIMUM DETECTION RANGE AND DISCOVERY OF LAND VEHICLES [DIE MAXIMALE AUFFASSREICHWEITE UND DIE AUFFINDBARKEIT VON LANDFAHRZEUGEN]
H. E. Hoffmann Jun. 1970 25 p refs Transl. into ENGLISH of West German report DFL-0475
(RAE-Lib-Trans-1484; DFL-0475) Avail: NTIS

Field experiments were made to determine the maximum detection range and the search success rate of acquiring land vehicles, depending on different environmental conditions and the characteristics of the observing instruments. The test object was a jeep of the German Bundeswehr. When observing without field-glasses the maximum detection range was between 1 and 2 km, for a standard visibility range from 8 to 56 km. For observations with a supported 15 × 60 field glass the maximum detection range varied. For small standard visibilities the maximum detection range was between 2 and 3 km, and for large standard visibilities it lay between 6 and 7 km. In evening twilight the maximum detection range decreased as the logarithm of the ambient brightness or as the time. It was not possible to determine any definite effect on the visibility of the jeep due to the length of the base (which varied between 15 and 175 cm); on the other hand, a larger magnification gave better visibility. In addition, binocular observations afforded some advantages over monocular observations. Author

N71-14653# Cambridge Acoustical Associates, Inc., Mass.
PRECURSOR WAVES FROM A CONTINUOUS TRANSITION LAYER IN THE SOUND SPEED PROFILE
David A. Sachs Aug. 1970 37 p refs

(Contract N00014-70-C-0080)
(AD-713601; CAA-U-361-222) Avail: NTIS CSCL 20/1

If a sound speed profile exhibits a relatively abrupt transition between two more or less uniform regions of differing sound speeds, it is often observed that among the signals produced by a distant sound source is one which arrives earlier than all others. This type of signal, which has been variously referred to as the precursor wave, the lateral wave or the head wave, is not explainable on the basis of ray acoustics. In the past, theoretical investigations have been made of the formation of precursors on both sharply abrupt and continuous transition layers. Following the methods of Lang, the author considers the precursors arising from a point sound source located in a homogeneous half-space connected to another isovelocity domain of higher sound speed through a transition zone in which the square of the index of refraction is a linear function of height. High frequency asymptotic expressions for the precursor pressures are developed for both the transition zone and the half-space in which the sound source is located. By means of Fourier transformation, the treatment is extended to include transient sound sources. Author (TAB)

N71-14569# Eidgenossische Technische Hochschule, Zurich (Switzerland).
AN APPARATUS FOR PRECISION MEASUREMENTS OF RESONANCE SHIFTS IN HIGH RESOLUTION NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY [EINE APPARATUR ZUR PRAEZISIONSMESSUNG VON RESONANZVERSCHIEBUNGEN IN DER HOCHAUFLOESENDEN MAGNETISCHEN KERNRESONANZ-SPEKTROSKOPIE]
Adalbert Huber (Ph.D. Thesis) 1969 104 p refs In GERMAN
(Diss-4232) Avail: NTIS

The construction of a high resolution nuclear magnetic resonance spectrometer is described that is able to precisely measure changes in relative chemical shifts of two resonance lines of a proton resonance spectrum up to 1 0/00 of line width. The relative chemical shift is obtained from resonance frequency differences of two nuclear resonance stabilizers that monitor the two resonance lines. Nuclear resonance signals and noise voltage of a single-coil measuring circuit with initial step-lattice base for the high frequency amplifier as well as the two feedback circuits for the stabilizers are calculated. The description of the 13-in electromagnet of the spectrograph for field strengths up to 24 kGauss contains calculations for current and flux stabilizers; the magnet system contains a linearized magnetic field sweep. Transl. by G.G.

N71-14678# Forsvarets Teletekniska Lab., Stockholm (Sweden).
AN INTRODUCTION TO EFFECTIVENESS ANALYSIS [EFFEKTIVITETSANALYS, EN INTRODUKTION]
H. Ebenfelt May 1969 10 p In SWEDISH
(FTL-A-A08-6) Avail: NTIS

In connection with new provisioning and maintenance planning it is of current interest to adjust modifications in use against the need for resources. The expected use should be measured in a realistic manner, i.e. interruptions in operation because of defects and for maintenance purposes must be taken into account. Starting from a defined conception of the system, a standard of use is introduced. Author

N71-14681# Forsvarets Forskningsanstalt, Stockholm (Sweden). Avdelning 2.
MEETING CONCERNING A QUANTUM ELECTRONICS SECTION OF THE EUROPEAN PHYSICAL SOCIETY [SAMMANTRAEDE ANGAENDE EN QE-SEKTION I EPS]
Britt Hartmann Aug. 1969 15 p In SWEDISH and ENGLISH
Conf. held in Bern, 13 – 14 Feb. 1969
(FOA-2-C-2333-51) Avail: NTIS

The meeting was arranged for informal discussions on how a quantum electronics section could be formed within the framework of the European Physical Society. The discussion on the immediate information available to the QE Section is referred to in the proceedings of the meeting. Also resulting from the meeting was discussion of some of the scientific investigations being carried out at the Institute in Bern. Author

N71-14682# Forsvarets Forskningsanstalt, Stockholm (Sweden). Avdelning 2.
TWO-DIMENSIONAL OPTICAL MODULATORS [TVADIMENSIONELLA OPTISKA MODULATORER]
Sten Nyberg Sep. 1969 13 p In SWEDISH
(FOA-2-C-2345-52) Avail: NTIS

Different ideas and suggestions for the modulation of two-dimensional coherent light waves are considered. Photographic film, with its long delay between exposure and use, is used almost exclusively for feeding information into an optical system for coherent optical picture treatment. A time variable modulator allows new applications and reduces processing time. Author

N71-14685# Martin Marietta Corp., Denver, Colo.
CRYOGENIC MATERIALS DATA HANDBOOK. VOLUME 1: SECTIONS A, B, AND C, REVISED
Fred R. Schwartzberg, Samuel H. Osgood, Carol Bryant, and Marvin Knight, comp. Wright-Patterson AFB, Ohio AFML Jul. 1970 722 p refs Revised
(Contracts AF 33(657)-9161; F33615-67-C-1794)
(AD-713619; AFML-TDR-64-280-Vol-1-Rev) Avail: NTIS CSCL 11/6

The report contains information on the cryogenic mechanical properties of aluminum alloys, stainless steel, and titanium alloys. TAB

N71-14686# Martin Marietta Corp., Denver, Colo.
CROYGENIC MATERIALS DATA HANDBOOK. VOLUME 2: SECTIONS D, E, F, G, H, AND I, REVISED
Fred H., Schwartzberg, Samuel H. Osgood, Carol Bryant, and Marvin Knight, comp. Wright-Patterson AFB, Ohio AFML Jul. 1970 554 p refs Revised
(Contracts AF 33(657)-9161; E33615-67-C-1794)
(AD-713620; AFML-TDR-64-280-Vol-2-Rev) Avail: NTIS CSCL 11/6

The report contains information on the cryogenic mechanical properties of superalloys, steel, miscellaneous metals and alloys, polymers, fiber reinforced plastics, and seals and gaskets. TAB

N71-14820# Eidgenossische Technische Hochschule, Zurich (Switzerland).
MAGNETIC SUSCEPTIBILITY OF CHROMIUM AND CHROMIUM ALLOYS [MAGNETISCHE SUSZEPTIBILITAET VON CHROM UND CHROMLEGIERUNGEN]
Dieter Bender (Ph.D. Thesis) 1969 53 p refs In GERMAN
(Diss-4179) Avail: NTIS

Considered is magnetic permeability of chromium and its binary cubic space-centered alloys with rhenium, rhutenium, osmium, molybdenum, and tungsten in the temperature region 4.2 smaller than or equal to T smaller than or equal to 700 K. Antiferromagnetic ordering of these alloys is expressed in lower spin susceptibility. A comparison with electron temperature coefficient measurements is used to approximate individual susceptibility properties and electron exchange effects. A positive temperature coefficient for susceptibility above Neel temperature is the criterium for the development of SDW-antiferromagnetisms in chromium-rhenium and chromium-osmium alloys. Transl. by G.G.

N71-14825# Michigan Univ., Ann Arbor. Radiation Lab.
SCATTERING BY A PERIODIC SURFACE
Tommy C. Tong and Thomas B. A. Senior Sep. 1970 69 p refs

(Contract F19628-68-C-0071)
(AD-713183; AFCRL-70-0507; Rept-1363-6-T) Avail: NTIS
CSCL 20/14

Numerical procedures are developed for the digital solution of the integral equations for the currents induced in a perfectly conducting, two dimensional periodic surface when a plane electromagnetic wave is incident. Data are obtained for the surface and far fields for a variety of sinusoidal surfaces for plane waves of either polarization at oblique as well as normal incidence, and the results are compared with the predictions of physical optics.
Author (TAB)

N71-15012# California Univ., Livermore. Lawrence Radiation Lab.
SIX LECTURES ON SHOCK-WAVE PHYSICS
R. N. Keeler and E. B. Royce 9 Feb. 1970 212 p refs
Presented at the 47th Course on Phys. of High Energy Density, Varenna, Italy, 14–26 Jul. 1969
(Contract W-7405-eng-48)
(UCRL-71846) Avail: NTIS

The following six chapters are given: (1) experimental techniques, (2) high-pressure equations of state from shock-wave data, (3) stability of the electronic configuration in metals at high pressures, (4) electrical conductivity of condensed media at high pressures, (5) properties of magnetic materials under shock compression, and (6) new experimental developments in shock-wave physics.
NSA

N71-15013# Iowa State Univ. of Science and Technology, Ames.
SUPERCONDUCTIVITY AND MAGNETIC ORDER IN La-Ce ALLOYS
John Jerome Wollan (Ph.D. Thesis) Sep. 1970 96 p refs
(Contract W-7405-eng-82)
(IS-T-405) Avail: NTIS

Superconductivity and magnetic order were studied both above and below the Kondo temperature for the La-Ce system. Electrical resistivity measurements on La 0.2, 1.0, 2.0, 3.2, and 4.0 wt. % Ce have been made from 0.06 to 20 K. All samples showed a Kondo-like minimum, T sub min, in the resistivity with a subsequent maximum, T sub max. T sub min was found to be proportional to n to the 1/7 power, where n is the concentration, and T sub max (H = 0) was proportional to n squared. The slope of the resistivity due to the magnetic impurities went as rho sub alpha lnT on both sides of T sub max. Above T sub max the proportionality constant, rho sub alpha, was almost independent of n, and below T sub max it was proportional to n squared. Applied magnetic fields had little effect on rho sub alpha even though T sub max increased linearly with H. The magnitude of the resistivity at the peak was essentially independent of n but decreased for increased H. The super-conducting transition temperature was depressed as n increased, and the critical field curves were considerably depressed below the multiple pair breaking theory of Fulde and Maki.
Author (NSA)

N71-15080# Institute of Nuclear Research, Warsaw (Poland).
LEAKAGE CURRENTS IN AN MHD GENERATOR
Z. Celinski 1970 25 p refs
(INR-1180) Avail: AEC Depository Libraries

The effect of leakage currents on the MHD generator performance was analyzed. There are two main paths for the leakage currents: through the side insulating walls and through the generator casing. The poor performance of the experimental Hall generators is due to the leakage to the generator casing. If only leakage currents through the side walls are present, they deteriorate the output power in the Faraday generator more than in the Hall one. In the analysis, constant channel cross section, constant magnetic field, and constant gas parameters in the channel were assumed.
Author (NSA)

N71-15081# Institut fur Plasmaphysik G.m.b.H., Garching (West Germany).
PARAMETRIC MOTION AND ITS EFFECTS ON PARTICLE DIFFUSION AND THE PLASMA DIELECTRIC CONSTANT
S. Puri Apr. 1970 12 p refs
(IPP-4/5) Avail: AEC Depository Libraries

A uniform electric field transverse to a spatially nonuniform magnetic field produces particle diffusion even when the electric field spectrum contains no dc component. This diffusion is additional to the usual E × B diffusion and occurs isotropically in the plane transverse to the magnetic field direction. The dielectric constant derived for the case of a uniform magnetic field is shown to be quite inappropriate for plasma in a spatially nonuniform magnetic field.
Author (NSA)

N71-15085# Institute for Perception RVO-TNO, Soesterberg (Netherland).
EVALUATION OF SOME COLORVISION TESTS IN BEHALF OF STANDARDIZATION OF TEST METHODS AND PROCEDURES [EVALUATIE VAN ENIGE KLEURZIENTESTS TEN BEHOEVE VAN STANDARDISATIE VAN TEST-METHODEN EN PROCEDURES]
J. J. Vos, W. Verkaik, and J. Boogaard 1970 39 p refs In DUTCH; ENGLISH summary
(IZF-1970-17; TDCK-56407) Avail: NTIS

The HRR, TMC, and Ishihara pseudo-isochromatic tests were examined for their structure by statistical analysis of test results. Based on the results, it is concluded that the HRR test is the best of the three, with the restriction that the official scoring method is not optimal. An improved scoring called HRR-R (from reevaluated) is proposed. The relevance of a diagnosis both in quality and quantity is demonstrated with examples. A standardized illumination is proposed with artificial daylight between 250 and 500 lux.
Author

N71-15111# Los Alamos Scientific Lab., N.Mex.
BIBLIOGRAPHY ON MAGNETIC FIELD MEASUREMENTS OF ACCELERATOR AND BEAM-HANDLING MAGNETS
Lore Watt, comp. Jul. 1970 19 p refs
(Contract W-7405-eng-36)
(LA-4478-BIB) Avail: NTIS

The bibliography includes abstracts from volumes 13 through 23 of NSA on (1) computer calculations of the field and/or of the particle trajectories in the field, and (2) actual physical measurements of the magnetic field including measurement techniques and measurements that have been made. Also, a collection of abstracts of papers presented at the Third International Conference on Magnet Technology held in Hamburg, Germany, on 19 to 22 May 1970 is included.
NSA

N71-15233# California Univ., Livermore. Lawrence Radiation Lab.
FINITE DIFFERERENCE SCHEME FOR CALCULATING PROBLEMS IN THREE SPACE DIMENSIONS AND TIME
M. L. Wilkins, S. J. French, and M. Sorem 13 Aug. 1970 5 p refs Presented at the 2d Intern. Conf. on Numerical Methods in Fluid Dyn., Berkeley, Calif., 15–19 Sep. 1970 Sponsored by AEC
(UCRL-72634; Conf-700906-1) Avail: NTIS

A two-dimensional space and time scheme is extended into a three-dimensional difference scheme for solving problems in elasticity, elastic-plastic flow and gas dynamics. Using Lagrange coordinates to define a mass zone, and octohedron grid is derived for calculating gradients of stresses. Results using this code were identical to a similar calculation using a two-dimensional axial symmetric computer program.
F.O.S.

N71-15245# Tennessee Univ., Knoxville.
SOME ENGINEERING PROBLEMS IN THE PRODUCTION OF STATIONARY MAGNETIC FIELDS

James Norfleet Luton, Jr. (Ph.D. Thesis) Jun. 1970 247 p refs Sponsored by AEC
(TID-25511) Avail: NTIS

Aspects associated with production of steady magnetic fields by the use of room-temperature magnet coils without iron are investigated. Work on the theory, technology, design, construction, and evaluation of such coils is discussed. A field was produced having both a certain strength and homogeneity by means of a coil using minimum power. The appropriate axial variation of ampere turns was achieved by a design using pancake coils with various current densities. The field of the coil was calculated to be homogeneous to one part in 10,000 over a roughly spherical volume 8.3 in in diameter, and its predicted field strength of 61.5 kC was 89% in. in diameter, and its predicted field strength of 61.5 kC was 89% of the maximum field strength obtainable from a coil with rectangular cross section and uniform current density having the same bore (13 in.) and power (7 MW). The measured field strength was equal to the predicted value, but because of an asymmetry introduced during manufacture of the coil, the initially measured homogeneity was relatively poor. Author (NSA)

N71-15248# Air Force Weapons Lab., Kirtland AFB, N.Mex.
INTEGRATED FOCAL PLANE IRRADIANCE PATTERNS FOR GAUSSIAN BEAMS FOCUSED THROUGH CIRCULAR ANNULAR APERTURES Technical Report, 1 May–15 Jul. 1970
Dale A. Holmes Oct. 1970 42 p refs
(AD-713728; AFWL-TR-70-102) Avail: NTIS CSCL 20/6

The diffraction of Gaussian light beams by circular apertures is considered. The far field or focal plane irradiance patterns are calculated and integrated over circular areas. The results of the irradiance integrations are displayed in graphical form using dimensionless coordinates. Using the Fresnel diffraction integral, it is analytically proved that the total beam power passing through the focal plane is exactly equal to the beam power transmitted by the aperture. Author (TAB)

N71-15265# Minnesota Univ., Minneapolis. Waterloo Univ. (Ontario). School of Physics and Astronomy.
GROUND STATE OF LIQUID HELIUM 4
R. D. Murphy and R. O. Watts [1969] 25 p refs Supported in part by Natl. Res. Council of Can. and Dept. of Interior Prepared in cooperation with Waterloo Univ.
(Contract AT(11-1)-1569)
(COO-1569-61) Avail: NTIS

A variational calculation of ground-state energy of liquid He-4 is performed under the assumption that the ground-state wave function is a product of pair functions and the potential energy is a sum of pair potentials. Results obtained from the Percus-Yevick (PY) and hypernetted chain (HNC) theories are compared with both Monte Carlo studies and with experiment. It is found that in the case studied the PY equation is considerably less accurate than the HNC and that the PY is not useful for this variational calculation but that the HNC is. A comparison of three model pair potentials indicates that the uncertainty in the pair potential produces an uncertainty in the ground-state energy of about 2 K. One of the pair potentials used leads to the best agreement yet obtained with experimental ground-state energies. Author (NSA)

N71-15275# California Univ., Los Angeles. Dept. of Physics.
EXPERIMENTAL STUDY OF THE LAMBDA TRANSITION OF LIQUID HELIUM USING FIRST SOUND ATTENUATION
Richard D. Williams Sep. 1970 89 p refs
(Contract N00014-69-A-0200-4014)
(AD-713478; TR-32) Avail: NTIS CSCL 7/4

The attenuation of first sound near the lambda point can be interpreted as being due to two phenomena: (1) a relaxation process described by Pokrovskii and Khalatnikov occurring only below the lambda point, and having a relaxation time of XiC2 where C2 is the velocity of second sound and Xi is a coherence length of magnitude 1.36 x 10 to the minus 8th power ((T sub Lambda)-T) to the minus 2/3 power cm; (2) a critical attenuation which is non-singular and symmetrical about T sub Lambda. Author (TAB)

N71-15284# National Bureau of Standards, Washington, D.C. Heat Division.
A RIGHT ANGLE He 3 CRYOSTAT INCORPORATING A HIGH FIELD SUPERCONDUCTING SOLENOID
H. Marshak and R. B. Dove Dec. 1970 24 p refs
(NBS-TN-562) Avail: SOD $0.30

Construction and operation of a novel He(3) cryostat, incorporating a large superconducting solenoid mounted at right angles to the cryostat's vertical axis, is described. This new cryostate which is part of the transportable National Bureau of Standards He(3) refrigerator, has been used successfully for nuclear orientation studies. Author

N71-15355# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.
TESTING FOR AN ORGANIC SUPERCONDUCTOR
Forrest J. Agee, Jr. and Glenn E. Spangler 1970 13 p refs
(AD-713501) Avail: NTIS CSCL 20/3

A very brief review is given of some of the theories on semiconducting polymers before describing new observations on the magnetic susceptibility of various dyes, sugars, aromatics, and polymers which were undertaken to test for any unusual diamagnetism indicating a Meissner effect. No superconductive properties were found. TAB

N71-15386# School of Aerospace Medicine, Brooks AFB, Tex. Otolaryngology Branch.
APPLICATION OF CURRENT AUDITORY DAMAGE RISK CRITERIA TO AEROSPACE OPERATIONS Final Report, Feb. 1967–Dec. 1969
Donald C. Gasaway and Harrell C. Sutherland Sep. 1970 27 p refs
(AD-713071; SAM-TR-70-36) Avail: NTIS CSCL 20/1

Valid and realistic criteria are needed for identifying and determining potentially hazardous noise encountered during ground and airborne aerospace operations. A set of criteria proposed by a working group on hearing, bioacoustics, and biomechanics, has been modified for easier interpretation and use in assessing auditory risk. An auditory risk calculator has been devised to simplify the task of assessing wide-band and narrow-band noise exposures. In addition, a simple chart has been prepared for use in evaluating intermittent noises. Examples of noise exposures encountered in aerospace operations are illustrated and applications of the three basic types of auditory risk criteria are demonstrated. Desirable and undesirable features of older and newer criteria are discussed. Author (TAB)

N71-15388# Cambridge Acoustical Associates, Inc., Mass.
SERIES EXPANSION FOR THE SOUND FIELD AT A CAUSTIC
David A. Sachs Sep. 1970 49 p refs
(Contract N00014-70-C-0080)
(AD-713597; CAA-U-363-222) Avail: NTIS CSCL 20/1

Higher order terms in a series expansion of the sound field in the vicinity of a caustic are given. The results are applicable to a caustic zone in an arbitrarily stratified medium at which sound energy from a time-harmonic point source is focused. The higher order terms can be used either to extend the domain of applicability of the lower order terms or to provide a measure of their accuracy. Author (TAB)

N71-15441# Atomic Energy Commission, Washington, D.C. Div. of Technical Information.
MAGNETIC FIELD AND HIGH-FREQUENCY INDUCTANCE

OF NESTED TORUSES
M. A. Stotland Sep. 1970 13 p refs Transl. into ENGLISH of Physicotech. Inst. of the State Comm. on the Util. of Atom. Energy USSR, Sukhumi, Preprint No. 1969-5
(AEC-tr-7168) Avail: NTIS

Equations are obtained that specify the vector potential, current density, and hf induction for a toroidal enclosure in terms of a combined system of plane and toroidal coordinates for the case when the skin layer is negligibly small. The effect of a gap in the surface of the torus is considered, and the current distribution on the surface of the torus is deduced for the case in which the gap is connected to a source of hf voltage. Author (NSA)

N71-15467* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
AUTOMATIC THERMAL SWITCH Patent
Ervin R. Wiebe, inventor (to NASA) Issued 12 Jul. 1966 (Filed 4 May 1965) 5 p Cl. 62-6 Sponsored by NASA
(NASA-Case-XNP-03796; US-Patent-3,260,056;
US-Patent-Appl-SN-453231) Avail: US Patent Office CSCL 09E

A gas such as helium may be cooled to cryogenic temperatures in successively interconnected cooling stages. An automatic thermal switch is described which can thermally couple two stages together to provide heat transfer between them but also insulates the stages from one another when a predetermined temperature is reached. The switch comprises two coaxial pipes within a cylindrical housing. The end of one pipe and the opposite end of the other pipe are sealed by flanges, and the pipes are supported within the cylinder so as not be be in contact. The cylinder is filled with a gas which transfers heat by convection and conduction, thus maintaining both flanges at about the same temperature. As the flange temperature drops, the gas eventually solidifies, producing a hard vacuum which insulates the flanges from each other. N.E.N.

N71-15648# Frankel (Sidney) and Associates, Menlo Park, Calif.
UNDERWATER ACOUSTIC IMAGING: PRELIMINARY FEASIBILITY STUDY Final Report
S. Frankel Sep. 1970 118 p refs Sponsored by AEC Prepared for Sandia Corp., Albuquerque
(SC-CR-70-6102) Avail: NTIS

Previous reports have discussed an imaging system which uses automatic power-level control (APC) to ameliorate the extreme diffraction effects from specularly-reflecting regions of acoustically smooth objects. The proper operation of such a system assumes, among other things, reciprocity for the transmission path in the propagating medium. Such reciprocity exists if the propagation system is isotropic and time-invariant. The first condition, isotropy, is a normal property of the medium. Deterioration in APC resulting from violation of the assumption of time-invariance is discussed. The effects of two sources of variation are considered: (1) relative motion between imager and object, and (2) variation in propagation-velocity gradient with time. It is shown that while the first of these can impose a significant limitation on the permitted relative lateral motion, the effect of the second appears to be negligible. Author (NSA)

N71-15673* Pratt and Whitney Aircraft, East Hartford, Conn.
VIBRATION DAMPING SYSTEM Patent
Trent H. Holmes and Thomas C. Walsh, inventors (to NASA) Issued 29 Mar. 1966 (Filed 3 Apr. 1964) 5 p Cl. 248-358 Sponsored by NASA
(NASA-Case-XMS-01620; US-Patent-3,243,154;
US-Patent-Appl-SN-357340) Avail: US Patent Office CSCL 20K

A vibration damping system for spacecraft mechanisms is described. The damper consists of a bellows arrangement, contained in a sealed housing. An inert gas is fed into the sealed areas up to a pressure of 15 to 30 psia, which is sufficient to prevent cold welding of the contacting surfaces when in operation. N.E.N.

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular, and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N71-14528# Institute for Nuclear Physics Research, Amsterdam (Netherlands).
PHYSICS WITH THE 85 MeV ELECTRON LINAC
Oct. 1970 62 p refs Presented at the Sardinia Conf. on Electron Scattering and Nucl. Struct., Sep. 1970
(INTERIKO-70/7) Avail: NTIS

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1. EVA: THE 85 MeV LINEAR ELECTRON ACCELERATOR (VERSNELLER) PROJECT AT AMSTERDAM P. J. T. Bruinsma, J. G. Noomen, and C. De Vries 7 p refs (See N71-14529 05-11)

2. AN ATTEMPT TO OBTAIN ABSOLUTE CROSS SECTIONS FOR ELASTIC SCATTERING FROM CARBON J. A. Jansen and R. Th. Peerdeman 9 p refs (See N71-14530 05-24)

3. ELASTIC SCATTERING FROM LEAD ISOTOPES C. W. de Jager, R. Maas, and H. Gompelman 6 p refs (See N71-14531 05-24)

4. INELASTIC SCATTERING FROM C-12 F. Th. Douma, A. Hurkmans, A. H. A. M. Roepke, and C. W. de Jager 25 p (See N71-14532 05-24)

5. ELECTROEXCITATION OF f 7/2 PROTON STATES IN V-51 P. K. A. de Witt Huberts, L. J. Oostrijk, and G. A. Peterson (Mass. Univ.) 11 p refs (See N71-14533 05-24)

6. ELASTIC ELECTRON SCATTERING THROUGH 180 DEG FROM THE MAGNETIZATION DISTRIBUTIONS OF THE Li-7 NUCLEUS AND OF THE 1f 7/2-SHELL NUCLEI Sc, V AND Co G. J. C. van Niftrik, H. de Vries, and L. Lapikas 18 p refs (See N71-14534 05-24)

N71-14530# Institute for Nuclear Physics Research, Amsterdam (Netherlands).
AN ATTEMPT TO OBTAIN ABSOLUTE CROSS SECTIONS FOR ELASTIC SCATTERING FROM CARBON
J. A. Jansen and R. Th. Peerdeman *In its* Phys. with the 85 MeV Electron Linac Oct. 1970 9 p refs (See N71-14528 05-24)
Avail: NTIS

Experimental determination of the cross sections involves the following parameters: beam current at the target, target thickness, the solid angle, detection efficiency, energy, and scattering angle. Elastic scattering cross sections for hydrogen are also considered for comparison. R.B.

N71-14531# Institute for Nuclear Physics Research, Amsterdam (Netherlands).
ELASTIC SCATTERING FROM LEAD ISOTOPES
C. W. de Jager, R. Maas, and H. Gompelman *In its* Phys. with the 85 MeV Electron Linac Oct. 1970 6 p refs (See N71-14528 05-24)
Avail: NTIS

Self-supporting foils of lead 206, 207, and 208 about 30 mg/sq cm thick were used at scattering angles of 90 and 149 deg and at energies from 40 to 80 MeV. The results show the difference in the cross section expected from an A(1/3)-dependence of the half-density radius. Muonic X-ray results, including experimental errors, and the cross section ratio of previous investigators are also given. R.B.

N71-14532# Institute for Nuclear Physics Research, Amsterdam (Netherlands).
INELASTIC SCATTERING FROM C-12

F. Th. Douma, A. Hurkmans, A. H. A. M. Roepke, and C. W. de Jager *In its* Phys. with the 85 MeV Electron Linac Oct. 1970 5 p (See N71-14528 05-24)
Avail: NTIS

The energy spectrum of electrons scattered from C-12 was measured up to an excitation energy of 16 MeV for three different (E, theta)-combinations at each of three values of the momentum transfer. Analysis shows that all transitions may be considered as either purely longitudinal or purely transverse. The results for 4.4, 9.64, and 15.1 MeV transitions are corrected for Coulomb distortion effects. The calculated results are given as chi square plots. R.B.

N71-14533# Institute for Nuclear Physics Research, Amsterdam (Netherlands).
ELECTROEXCITATION OF f 7/2 PROTON STATES IN V-51
P. K. A. de Witt Huberts, L. J. Oostrijk, and G. A. Peterson (Mass. Univ.) *In its* Phys. with the 85 MeV Electron Linac Oct. 1970 11 p refs (See N71-14528 05-24)
Avail: NTIS

Inelastic electron scattering form factors were measured and B(E2)'s extracted for the first four excited states of V-51. The B(E2) values agree with a shell-model description of the states using an effective proton charge of 1.6 e. Author

N71-14534# Institute for Nuclear Physics Research, Amsterdam (Netherlands).
ELASTIC ELECTRON SCATTERING THROUGH 180 DEG FROM THE MAGNETIZATION DISTRIBUTIONS OF THE LI-7 NUCLEUS AND OF THE 1F 7/2-SHELL NUCLEI Sc, V AND Co
G. J. C. van Niftrik, H. de Vries, and L. Lapikas *In its* Phys. with the 85 MeV Electron Linac Oct. 1970 18 p refs (See N71-14528 05-24)
Avail: NTIS

For the Li-7 nucleus, cross sections for scattering from the ground state and first excited state were measured in the energy range of 25 to 90 MeV with an energy resolution better than 200 keV. A shell model analysis of the data was performed. From the ratio of cross sections, preference for LS-coupling was found. For the 1f(7/2)-shell nuclei Sc, V, and Co cross sections for the elastic scattering from the ground states were measured in the energy range of 40 to 90 MeV. Rms radii for the magnetization distributions were extracted. Author

N71-14552# Purdue Univ., Lafayette, Ind. Project Squid Headquarters.
ESTIMATE OF POTENTIAL SURFACE FOR K-Cl-Cl
Carl Nyeland (Copenhagen Univ.) and John Ross (MIT, Cambridge) Sep. 1970 29 p refs Sponsored in part by NSF Prepared by MIT, Cambridge
(Contract N00014-67-A-0226-0005; Proj. Squid)
(AD-713123; SQUID-TR-MIT-55-PU) Avail: NTIS CSCL 7/4

An estimate of the potential surface of the system (K-Cl-Cl) has been made by first considering the configuration (K(+), Cl2(-)) in a perturbation and variation treatment, and then considering with the aid of a number of approximations the combination of ionic and neutral terms (K, Cl2), (KCl, Cl). Author (TAB)

N71-14554# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE EFFECT OF STRUCTURE ON RADIATION CHEMICAL REACTIVITY
Nathan Klein 1969 11 p refs
(AD-713551) Avail: NTIS CSCL 7/5

Several aspects of the radiation chemistry of water are discussed. It is proposed that the very fast reaction of e(-)(aq) is: e(-)(aq) + H2O(+) yields H_2O^*. The product of the reaction, H_2O^*, is an electron-hole pair, or exciton. The very large size and high mobility of the water cluster makes an encounter radius of 25A for the reaction reasonable. The existence, in aqueous solution, of both holes and excitons has been proposed although experimental evidence to date is still so sparse as to be highly conjectural. Author (TAB)

N71-14577# Commissariat a l'Energie Atomique, Fontenay-Aux-Roses (France). Centre d'Etudes Nucleaires.
COMPUTER CALCULATION OF GAMMA-LOGGINGS IN URANIFEROUS DEPOSITS
Rene Coulomb, Jacques Desgeans, Lucien Le Quan, and Maurice Salichon Jun. 1970 45 p refs In FRENCH
(CEA-N-1279) Avail: AEC Depository Libraries

The mathematical method and the FORTRAN program used for 3 years for routine interpretation of gamma-loggings in uraniferous deposits are described. This method is only one step in the overall program for using field data for the estimation and economical optimization of ore bodies. All the stages of calculation are permanently checked and visualized by digital tracers or an IBM 2250 conversational computer. Author (NSA)

N71-14578# Saarland Univ., Saarbruecken (West Germany). Mathematisches Inst.
AN APPROACH TO THE THEORY OF PRESSURE BROADENING OF SPECTRAL LINES Final Technical Report, Mar. 1969 - Feb. 1970
Wilhelm von Waldenfels 8 Mar. 1970 76 p refs
(Contract DAJA37-68-C-0972)
(AD-704361; ARDG(E)-E-1351) Avail: NTIS CSCL 7/4

An attempt has been made to give a rigorous treatment of pressure or Stark broadening under the assumptions that: (1) the perturbating particles more independent one from the other on straight lines with constant velocity V are distributed in the space with mean density n, and the directions of their velocities are uniformly distributed on the unit sphere; and (2) interactions of particles whose impact parameter is bigger than some constant sigma and interactions of particles with impact time t(p) at times t are ignored. USGRDR

N71-14580# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).
THE CHELATE FORMATION OF PENTAVALENT NEPTUNIUM AND PLUTONIUM WITH ALPHA-AMINO ACIDS
Ulrich Wede (Kernforschungszentrum) Jul. 1970 37 p refs Transl. into ENGLISH from German Report No. KFK-837
(LIB/Trans-261; KFK-837) Avail: AEC Depository Libraries

Photometric titration and cation exchange methods were used to study the formation of Pu(V) and Np(V) chelates with alpha-amino acids. Glycine formed a 1:1 and 1:2 chelate. Dibasic and tribasic alpha-amino acids formed hydrogen complexes and 1:1 chelates. At pH 10 the chelates of the polybasic ligands were hydrolysed to chelate hydroxides. On the basis of composition and the various values obtained for stability constants, three types of compound were deduced. These were: eight-membered monocyclic hydrogen complexes, bicyclic hydrogen chelates or normal chelates consisting of 2 five-membered rings, and chelate hydroxides. NSA

N71-14588*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LONG-RANGE INTERACTION POTENTIALS FOR OXYGEN
Willard E. Meador Washington Jan. 1971 31 p refs
(NASA-TN-D-6122; L-5736) Avail: NTIS CSCL 07D

Electron configurations and valence bond interaction energies are derived for the 18 molecular combinations of two ground-state oxygen atoms. The method differs from previous valence bond calculations in three respects: (1) correlations between molecular and atomic states are included, (2) proper relations between the various multielectron bonds and antibonds are employed, and (3) configuration interactions between molecular states of the same symmetry are determined. Many of the long-range interaction potentials are affected substantially by these modifications. Author

N71-14618# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
DIFFICULTY AND POSSIBILITY OF KINETIC THEORY OF QUANTUM-MECHANICAL SYSTEMS. PART 5: PARTICULAR AND GENERAL SOLUTIONS OF THE SCHRODINGER EQUATION AND THEIR SIGNIFICANCE IN KINETIC THEORY
Toyoki Koga Aug. 1970 33 p refs
(Contracts Nonr-839(38); DAHC04-69-C-0077; ARPA Order 529; ARPA Order 1442; Proj. Strategic Technology)
(AD-713605; PIBAL-70-36-Pt-5) Avail: NTIS CSCL 20/10

The quantum-mechanical Liouville equation is more restrictive and hence more informative than the Schrodinger equation, because the former already contains the definition of independent variable p, momentum in a special case. In this sense, the quantum-mechanical Liouville equation is more definitive as the description of a physical law, and is shown to be invariant under the Galilean transformation. By taking advantage of this convenience, the author obtains a particular solution of the Schrodinger equation for n-particle system. This solution is localized in the phase space and stable in time, and seems to represent an n-particle system as single system. The de Broglie wave is constructed by superposing a number of similar particular solutions for single-particle systems. Similarly, general solution is constructed for n-particle systems. For justification of its application to kinetic theory, Paulis principle is analyzed and interpreted anew. The present solution promises the possibility of rational methods of kinetic theory of quantum-mechanical systems, as analogous to methods of classical kinetic theory. Author (TAB)

N71-14620# Research Inst. of National Defence, Sundbyberg (Sweden).
DESCRIPTION OF A PROGRAMME FOR CALCULATING, SORTING, AND TABULATING MASS DIFFERENCES. DETERMINATION OF THE EMPIRICAL FORMULA FOR A MOLECULE (FRAGMENT) [BESKRIVNING AV PROGRAM FOER BERAEKNING, SORTERING OCH TABULERING AV MASSAVVIKELSER. BESTAEMNING AV BRUTTOFORMELN FOER EN MOLEKYL (FRAGMENT)]
Jan Isakseon and Ingemar Widegren Aug. 1969 33 p ref In SWEDISH
(FOA-1-C-1319-34) Avail: NTIS

The programme tabulates the mass differences (sorted in order of size) for molecules built up from carbon, hydrogen, nitrogen, oxygen, fluorine, phosphorus, and sulphur atoms. The highest admitted are 6 nitrogen, 8 oxygen, 3 fluorine, 2 phosphorus and 4 sulphur atoms. By making changes in the dimension, format, etc., higher figures can be selected. With the help of the table the gross formula for a molecule or a fragment with possible atom combinations can be determined as above. With respect to fragments, it is only valid when they contain the primary isotopes, so that the method can function safely. The results of production runs are given in tabular form for three examples. Author

N71-14626# Oak Ridge National Lab., Tenn.
CHEMISTRY DIVISION RESEARCH Annual Progress Report, Period Ending 20 May 1970
G. E. Moore, ed. Sep. 1970 208 p refs
(Contract W-7405-eng-26)
(ORNL-4581) Avail: NTIS

Spectra of alpha emitting yields from reactions of Pu-231 with protons at 44 and 63 MeV are presented. Nuclear energy states in Pu-240 were investigated by observing gamma rays emitted following beta decay of Np-240 isomers and following alpha decay of Cm-244. The ion-component treatment of free energy data was applied to mixtures containing NaCl, Na2SO4, MgSO4, and MgCl2 in aqueous solution. Equations for osmotic and activity coefficients were derived. Absorption spectra of transient production in the flash photolysis of aqueous nitric oxide solutions and the electron pulse radiolysis of sodium nitrate are reported. Calcium-49 decay was studied, along with energies and intensities of newly observed transitions in the gamma spectra. Preliminary studies are underway in a search for a new method for heavy water production. J.A.M.

N71-14671# Idaho Nuclear Corp., Idaho Falls.
SLOW NEUTRON INELASTIC SCATTERING PROGRAM AT THE MTR, 1958–1970
Sep. 1970 40 p refs
(Contract AT(10-1)-1230)
(IN-1427) Avail: NTIS

The Inelastic Scattering Program at the MTR is reviewed. The product of the program is data describing how thermal neutrons are scattered and moderated by materials. The comparison of experimental and theoretical data is presented. NSA

N71-14719# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
BMC-1: THE BATTELLE MONTE CARLO CODE
D. H. Thomsen and T. M. Traver Jun. 1970 147 p refs
(Contract AT(45-1)-1830)
(BNWL-1433) Avail: NTIS

The Battelle Monte Carlo code (BMC) is a general purpose neutronic Monte Carlo code written in FORTRAN-5 for use on the UNIVAC-1108 computer. The code was developed primarily for use in solving some of the more complex problems encountered in predicting the neutronic characteristics of thermal reactors. It is flexible as to the size and type of problem to be solved and in the cross section and geometry detail which may be used. The neutron fluxes and reaction rates in the energy range from 0 to 10 MeV are calculated in one, two or three space dimensions. Statistical confidence limits are assigned to the results. The cross sections utilized in the BMC code are processed from data in the ENDF/B format. Author (NSA)

N71-14720# Idaho Nuclear Corp., Idaho Falls.
CORA: A FEW GROUP DIFFUSION THEORY CODE FOR ONE-DIMENSIONAL REACTOR ANALYSIS
E. C. Anderson and G. E. Putnam Aug. 1970 122 p refs
(Contract AT(10-1)-1230)
(IN-1418) Avail: NTIS

The CORA few group (four), one-dimensional neutron diffusion program is written in FORTRAN 4 and is currently operating on

IBM 360 Series machines with a requirement for 250 K of core storage. The program solves for either the direct flux or adjoint solution in slab, cylindrical, or spherical geometry. It uses the standard Gaussian elimination and backsolution methods for solving the difference equations for the mesh point fluxes in each group and it uses the usual power method or source iteration method with optional Chebyshev acceleration to solve eigenvalue problems. The program allows: very general boundary conditions (with sources); all the usual buckling, poison, region dimension, and boundary searches as well as a special total fission source search that allows quick solution of fixed source problems in reactors near critical; very general fixed volume sources (group and space dependent); and edits of peak-to-average ratios of important quantities, neutron balances by group and region, and currents and leakages at region boundaries. Author (NSA)

N71-14721# Brookhaven National Lab., Upton, N.Y.
INVESTIGATION OF THE ALPHA SPECTRUM OF SHORT-LIVED RARE EARTH ISOTOPES
I. Mahunka Jun. 1970 13 p refs Transl. into ENGLISH from Acta Phys. Akad. Sci. Hung. (Hungary), v. 28, 1970 p 229–235 Sponsored by AEC
(BNL-tr-356) Avail: NTIS

The alpha-particle energies, half-lives and alpha branching ratios of Dy-150, Ho-151,152,153, and Er-153,154,155 were investigated with a semiconductor alpha-spectrometer. The isotopes were produced by spallation of Ta, Lu, Er and Dy with 660-MeV protons. Author (NSA)

N71-14725# Oak Ridge National Lab., Tenn.
RADIOCHEMICAL SEPARATIONS OF HAFNIUM, TANTALUM, AND GERMANIUM FROM TUNGSTEN AND SELENIUM IRRADIATED BY 14-MeV NEUTRONS
Jean Blachot et al Oct. 1970 10 p refs Transl. into ENGLISH from a French Report Sponsored by AEC
(ORNL-TR-2390; CEA-R-3678) Avail: NTIS

The radiochemical separations of hafnium, tantalum, and germanium isotopes from tungsten and selenium, irradiated by 14-MeV neutrons is discussed. The methods used for each isotope and the application of nuclear spectrometry to determine the results are presented. Author

N71-14775# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
PACIFIC NORTHWEST LABORATORY ANNUAL REPORT TO THE USAEC DIVISION OF BIOLOGY AND MEDICINE, 1969. VOLUME 2: PHYSICAL SCIENCES. PART 2: RADIOLOGICAL SCIENCES
J. M. Nielsen Feb. 1970 72 p ref
(Contract AT(45-1)-1830)
(BNWL-1307-Vol-2-Pt-2) Avail: NTIS

The trace elements Cs, U, Sb, Co, Sc, Fe, Zn, and Hg were determined in a single 25 ml sample of sea water by neutron activation and direct gamma spectrometry using multidimensional and Ge(Li) analyzers. Chemical structures and reactivities of free radicals formed in irradiated model systems were studied in order to understand and alleviate the development of radiobiological damage. Meteorological, chemical, and radiochemical compositions of atmospheric aerosols from ground level to maximum attainable altitudes were investigated to determine the rates and mechanisms by which airborne radionuclides become attached to the aerosol, the origin and chemistry of the host aerosol, and the rates and mechanisms of mixing and scavenging processes in the atmosphere. Inhalation hazards to uranium miners, internal depositions of radionuclides in man, radiation dosimetry, Fe-55 in man, in-cloud scavenging, and physical and radiological chemistry of ocean solutions are also reviewed. J.A.M.

N71-15006# Oak Ridge National Lab., Tenn. Neutron Physics Div.
LATERAL SPREAD OF HIGH ENERGY (< OR = 400 MeV) NEUTRON BEAMS AND EARTHSHINE
R. G. Alsmiller, Jr., F. R. Mynatt, M. L. Gritzner, J. V. Pace, and J. Barish 3 Aug. 1970 19 p refs Sponsored by AEC
(ORNL-TM-3025) Avail: NTIS

Calculated results obtained using the method of discrete ordinates are presented for the cases of zero-width beams of 100- and 400-MeV neutrons normally incident along the axis of a cylindrical shield of silicon dioxide with 5% water by weight. The results include the omnidirectional neutron flux per unit energy and the neutron and photon dose equivalents as a function of depth and radius in the shield. In the vicinity of well-shielded target areas of high-energy accelerators, the neutrons and photons that diffuse through the ground under the shield, earthshine, often pose a radiation hazard. Calculated results of the earthshine from a 400-MeV neutron source in a specific geometry are presented and discussed. Author (NSA)

N71-15007# Comision Nacional de Energia Atomica, Buenos Aires (Argentina).
DEVELOPING Tc 99m GENERATORS [OBTENCION DE GENERADORES DE TC 99M]
Alfredo Karpeles and Maria Cristina Palcos 1970 16 p refs In SPANISH; ENGLISH summary
(CNEA-267) Avail: AEC Depository Libraries

A description is given of a simple and improved technique to isolate and purify Mo-99 from fission products, obtained from uranium dioxide irradiated with thermal neutrons. A semi-remotely operated equipment was designed to work safely with 1 Ci of fission products. The irradiated sample was dissolved in a closed reactor and the gases evolved were washed and partially fixed in alkaline traps and activated charcoal. Molybdenum was separated from the solution by adsorption on alumina and purified by ion exchange to isolate it from other fission products. Finally, it was fixed on a chromatographic column, from which the daughter, Tc-99, was eluted selectively carrier-free and with high specific activity, as required for medical applications. The impurity percentages were determined at different stages with radioactive tracers. With this technique it was possible to separate 60 mCi of Mo-99 each run, obtaining a chemical yield over 70% and a separation factor over 1000. Author (NSA)

N71-15008# Argonne National Lab., Ill. Chemical Engineering Div.
FLUX-CHARACTERIZATION AND NEUTRON CROSS SECTION STUDIES IN EBR-2
N. D. Dudley and R. R. Heinrich May 1970 23 p refs
(Contract W-31-109-eng-38)
(ANL-7629) Avail: NTIS

The current status of flux-characterization studies in EBR-2 using foil-activation techniques is reviewed. Activation-rate data are obtained by irradiating monitor foils and radiochemically determining the disintegration rate of each foil at the time of the end of the irradiation. Equations are presented to convert the disintegration rates to activation rates, including corrections for power-level fluctuations. The flux values are determined from a computed spectrum-averaged cross section and the activation rate. The method used to compute spectrum-averaged cross sections from reactor-physics calculations is described briefly. Flux values are compared with reference values, and the deviations are discussed. The principal considerations in using measured flux values involve the compositional changes in EBR-2, and the perturbations in the flux due to heterogeneous effects within the reactor. Measurements at high and low power are compared, the conclusion being that, within the uncertainties of the data, no discrepancy between the flux per megawatt at high and low power is observable. Author (NSA)

N71-15009# City Univ. of New York. Dept. of Chemistry.
[RADIOCHEMISTRY] Progress Report, 1 Jun. 1969–31 May

1970
Harmon L. Finston 31 May 1970 18 p
(Contract AT(30-1)-3417)
(NYO-3417-12) Avail: NTIS

Developments are reported for studies on: nuclear reactions of C-12, Ne-20, and Ar-40 induced by 14-MeV neutrons; thermal neutron capture cross sections of some reactor produced radionuclides; mechanism of synergic solvent extraction; and application of radioreagents. Author (NSA)

N71-15018# California Univ., Livermore. Lawrence Radiation Lab.
ION CYCLOTRON INSTABILITY IN A NONUNIFORM MAGNETIC FIELD [IONNAYA TSIKLOTRONNAYA NEUSTOICHIVOST V NEODNORODNOM MAGNITNOM POLE]
A. V. Timofeev Aug. 1970 69 p refs Transl. into ENGLISH from Russian report IAE-1939 Sponsored by AEC
(UCRL-Trans-10482; IAE-1939) Avail: NTIS

Nonuniformity of the magnetic field disturbs the resonance between cyclotron oscillations and the revolving of charged particles around the Larmor circumference. This decreases the increment of unstable natural oscillations of plasma having a frequency close to the ion cyclotron frequency. The stabilizing effect is particularly pronounced with a high electron temperature. Author (NSA)

N71-15019# Los Alamos Scientific Lab., N.Mex.
ELECTRON CYCLOTRON DRIFT INSTABILITY
D. W. Forslund, R. L. Morse, and C. W. Nielson Jul. 1970 10 p refs
(Contract W-7405-eng-36)
(LA-4487-MS) Avail: NTIS

Analytic and numerical calculations demonstrate a plasma instability driven by currents flowing normal to a magnetic field. Author (NSA)

N71-15021# Saha Inst. of Nuclear Physics, Calcutta (India). Theoretical Nuclear Physics Div.
LOW-ENERGY KAON-NUCLEON SCATTERING
S. Baba Pundari and B. Dutta-Roy [1970] 16 p refs
(SINP-TH-67-17) Avail: AEC Depository Libraries

The successes of the current algebra method and the vector-meson dominance approach for S-wave kaon-nucleon scattering lengths are taken to suggest an answer that in the absence of t-channel singularities, low energy S-wave kaon-nucleon scattering is absent. This leads to certain sum rules which allows a determination of the kaon-baryon coupling constants which agree very well with other estimates. These values of the coupling constants are then found to give a satisfactory fit to low-energy kaon-nucleon S- and P-wave phase shifts. Author (NSA)

N71-15022# Saha Inst. of Nuclear Physics, Calcutta (India).
MODIFIED REGGE REPRESENTATION
Suprokash Mukherjee [1970] 12 p refs
(SINP-TH-67-6) Avail: AEC Depository Libraries

A Regge-type representation for the scattering amplitude is proposed, which has correct asymptotic behavior for small k and large lambda and small background integral. Author (NSA)

N71-15029# Saha Inst. of Nuclear Physics, Calcutta (India).
POSITIVE PARITY MESONIC STATES AND UNITARY SYMMETRY
B. Dutta-Roy and S. Baba Pundari [1970] 7 p refs
(SINP-TH-67-1) Avail: AEC Depository Libraries

Evidence is presented for an octet of 0(+) (scalar) mesons and a nonet of 1(+) (axial-vector) mesons, which may together form a 35-plet SU(6)-supermultiplet. Predictions are made for masses and decay widths of the 35(+)-plet resonances. It is noted that the S-wave decay 35(+) yields 35(−) + 35(−) is not forbidden by SU(6), which is the first physically realized case where decays are not forbidden by pure SU(6). NSA

N71-15030# Saha Inst. of Nuclear Physics, Calcutta (India).
LEPTONIC DECAYS OF BARYONS AND T-VIOLATION
B. Dutta-Roy and S. Baba Pundari [1970] 8 p refs
(SINP-TH-67-2) Avail: AEC Depository Libraries

A phenomenological model of T-violation for the leptonic decays of baryons is presented which yields markedly different results from those given by the model proposed by Jackson, Treiman, and Wyld; for instance, the decay asymmetry (of the plane containing the electron and neutrino moments with respect to the direction of polarization of the decaying baryon) has, in the present model, an interesting dependence on the electron energy. The possibility of such an energy dependence of the above mentioned T-violating asymmetry should be borne in mind, in planning experiments to test T-invariance in the leptonic decays of baryons, and in discriminating between the two models. Author (NSA)

N71-15032# Centre National de la Recherche Scientifique, Strasbourg (France). Lab. de Chimie Nucleaire.
CHEMICAL EFFECTS OF NUCLEAR TRANSFORMATIONS: BIBLIOGRAPHY, 1969 [EFFETS CHIMIQUES DES TRANSFORMATIONS NUCLEAIRES: BIBLIOGRAPHIE, 1969]
J. P. Adloff 1969 37 p refs partly in ENGLISH; partly in FRENCH; partly in GERMAN
(NP-18402) Avail: AEC Depository Libraries

The 1969 bibliography reviews 215 alphabetic references. A classified index of elements and isotopes and an alphabetic index of various authors' works are presented. Author (NSA)

N71-15033# Oak Ridge National Lab., Tenn.
A Re 188 GENERATOR USING W 188 [UN GENERATEUR DE RE 188 A PARTIR DE W 188]
J. Blachot et al May 1970 7 p refs Transl. into ENGLISH from Int. J. Appl. Radiat. Isotop. (England), v. 20, 1969 p 467–470 Sponsored by AEC
(ORNL-tr-2293) Avail: NTIS

Tungsten 188 is produced by double neutron capture on W-186. The generator is prepared by absorbing the W on Dowex 1 in the fluoride form. Elution of the Re-188 is accomplished by means of a solution of HclO4(1N). Author (NSA)

N71-15083# Gulf General Atomic San Diego, Calif.
DEVELOPMENT OF NUCLEAR ANALYTICAL TECHNIQUES FOR OIL SLICK IDENTIFICATION, PHASE 1
D. E. Bryan, V. P. Guinn, R. P. Hackleman, and H. R. Lukens 21 Jan. 1970 134 p refs
(Contract AT(04-3)-167)
(GA-9889) Avail: NTIS

Neutron activation analysis (NAA) has been found to quantitatively measure a large number of trace elements in crude oils and residual fuel oils. Examination of trace element concentrations in oils before and after exposure to wave action, elevated temperature, ultraviolet light, and bacteriological attack demonstrates that the large majority of these concentrations were only slightly affected by a minimal exposure, after which they were stable toward further exposure. Each trace element concentration represents an evidence point for comparison of oil samples, and it was found that there were more than enough stable evidence points determinable by NAA to distinguish between each of 40 different oil samples. Determination of S-34/S-32 of oil specimens reveals that this ratio is another useful evidence point. Author (NSA)

N71-15084# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.
LINEAR STARK EFFECT OF THE R' CENTER IN LiF

J. A. Davis and D. B. Fitchen Aug. 1970 16 p refs
(Contract AT(30-1)-3464)
(NYO-3464-25; Rept-1414) Avail: NTIS

A resolved linear Stark splitting is observed for the R' zero-phonon line in absorption, in good agreement with the predictions for an A to E transition at a center of C(3v) symmetry. Author (NSA)

N71-15086# Brookhaven National Lab., Upton, N.Y.
APPLICATION OF THE SLOWING DOWN SPECTROMETER TO NUCLEAR MATERIALS ASSAY
J. R. Beyster Apr. 1970 28 p refs
(BNL-50232) Avail: NTIS

The use of lead slowing down spectrometers, which use a 14-MeV neutron source and lead shielding to moderate the spectrum to obtain the neutron energies of interest, for nuclear materials assay work is evaluated. Features of the spectrometer are discussed including calculations of intensities and estimates of isotope discrimination capabilities. Advantages and disadvantages of assay techniques based on the use of slowing down spectrometers are listed with suggestions for possible new research on the instrument. NSA

N71-15092# California Univ., Livermore. Lawrence Radiation Lab.
SOME OBSERVATIONS ON THE RADIOLOGICAL ASPECTS OF FUSION
J. D. Lee 19 Aug. 1970 12 p refs Submitted for publication Sponsored by AEC
(UCRL-72309; Conf-700912-1) Avail: NTIS

The analysis presented is based on deuterium–tritium fusion, which produces 14.1-MeV neutrons, and a lithium–niobium, tritium–breeding blanket. Penetrating radiation consisting of primary fusion neutrons plus secondary and decay gammas produced in the blanket is roughly an order of magnitude greater than that produced in a fission reactor. Therefore, fusion reactors require greater neutron and gamma shielding than fission reactors. An estimate of fusion's contamination hazard is based on activity levels of the blanket activation products, T-3, Li-8, Nb-92, and the two isomers of Nb-94. These activity levels are weighted by their respective permissable concentration levels, summed, and compared with a fission reactor's potential radiological contamination hazard calculated in a like manner. The DT fusion reactor is estimated to be both cleaner and easier to contain than a fission reactor operating at the same power level. Author (NSA)

N71-15093# Purdue Univ., Lafayette, Ind.
MEASUREMENT OF THE E2/M1 AMPLITUDE RATIOS OF GAMMA TRANSITIONS IN THE EVEN-EVEN ISOTOPES OF Os AND Pt
K. S. Krane and R. M. Steffen [1970] 5 p refs Presented at the Conf. on Angular Correlations in Nucl. Disintegration, Delft, Netherlands Sponsored by AEC
(COO-1746-35; Conf-700807-1) Avail: NTIS

The gamma-gamma directional correlations following the decays of Ir-186, 188, 190 and Au-194, 196 were measured using high resolution Ge(Li) detectors and multichannel coincidence and routing techniques. The data were used to determine the E2/M1 amplitude ratios of gamma transitions in OS-186, 188, 190 and Pt-194, 196. The results are compared with microscopic calculations. NSA

N71-15094# Washington Univ., St. Louis, Mo. Dept. of Chemistry.
REACTION STUDIES OF HOT SILICON AND GERMANIUM RADICALS Progress Report, 1 Sep. 1969–31 Aug. 1970
Peter Paul Gaspar 31 Aug. 1970 11 p refs
(Contract AT(11-1)-1713)
(COO-1713-20) Avail: NTIS

Progress is reported on reactions of recoiling silicon atoms with phosphine, silane, and disilane; reactions of recoiling silicon atoms with phosphine–alkane mixtures; moderator studies; kinetics of silyl radical reactions; generation of silicon and germanium atoms by chemical methods; and improved instrumentation for recoil experiments. NSA

N71-15095# Los Alamos Scientific Lab., N.Mex.
TESTS OF NEUTRON CROSS SECTIONS
Carroll B. Mills Apr. 1970 30 p refs
(Contract W-7405-eng-36)
(LA-4429) Avail: NTIS

The interaction of neutrons with matter over the energy range of 0 to 14 MeV with differential neutron cross sections as well as the results of measurements showing the kinds and magnitudes of these interactions are analyzed. Integral experimental results on neutron multiplication in a variety of assemblies and of the effects of inserting a variety of materials into these assemblies are studied to improve cross section accuracy. These improvements are qualitative and indicate areas of interest for supplementary differential measurements. Materials of interest to power breeder reactor physics and for application to high-temperature, gas-cooled reactors were tested for accuracy by perturbation theory methods. The values were generally found to be approximately correct. Author

N71-15096# Los Alamos Scientific Lab., N.Mex.
BIBLIOGRAPHY ON NEUTRAL PARTICLE TRANSPORT THEORY
W. L. Hendry, K. D. Lathrop, Sue Vandervoort, and John Wooten, comps. Sep. 1970 182 p refs
(Contract W-7405-eng-36)
(LA-4287-MS) Avail: NTIS

This report contains 1849 references to the technical literature on neutral particle transport theory. Two listings are included: one by author and one by subject. Author (NSA)

N71-15098# Stanford Linear Accelerator Center, Calif.
WIRE SPARK CHAMBER SPECTROMETER AT SLAC
G. T. Armstrong, F. Bulos, R. K. Carnegie, G. E. Fischer, M. J. Beniston (IBM, Palo Alto, Calif.) et al Sep. 1970 10 p refs Presented at Intern. Conf. on Instrumentation for High Energy Phys., Dubna, USSR, 8-12 Sep. 1970 Sponsored by AEC
(SLAC-PUB-801; Conf-700902-4) Avail: NTIS

The characteristics and performance of a wire spark chamber system using a secondary pion beam at SLAC for the study of reactions of the form pion(-) proton yields 2 or more charged particles are described. Topics discussed include the pion beam transport system; wire spark chambers, their associated high voltage pulsing system, and magnetostrictive readout; a large multicell Cherenkov counter; and computer facilities used in on-line and off-line analysis of data. The properties of this system with respect to its acceptance and resolution in mass, missing mass, and momentum transfer, are analyzed and examples presented. Author (NSA)

N71-15104# California Univ., Berkeley. Lawrence Radiation Lab.
NEUTRAL DECAYS OF THE ETA-MESON (0)
Thomas Bard Risser (Ph.D. Thesis) 1 Aug. 1970 145 p refs
(Contract W-7405-eng-48)
(UCRL-20039) Avail: NTIS

Eta-mesons were produced by the reaction pion(-) proton yields eta-meson(0) neutron. Veto counters surrounding the hydrogen target in which this interaction takes place eliminate all reactions involving charged particles. The neutral decays of the eta-meson are studied with a cubical array of lead plate spark chambers for the conversion of gamma rays. The eta-producing reaction is identified by the time of flight of the neutron from the hydrogen

target. The neutron is detected by one of twenty large scintillation counters. It is found that the data are consistent with zero decays of the type eta-meson(0) yields pion(0) photon photon.
Author (NSA)

N71-15105# Argonne National Lab., Ill. Chemistry Div.
COMPUTER PROGRAM FOR THE KINETIC TREATMENT OF RADIATION-INDUCED SIMULTANEOUS CHEMICAL REACTIONS: A REVISED VERSION OF FORTRAN 4
Klaus H. Schmidt Mar. 1970 56 p
(Contract W-31-109-eng-38)
(ANL-7693) Avail: NTIS

WR20, a program written in OS/360 FORTRAN 4 for an IBM-360/75 digital computer system, calculates, as a function of time, the concentrations of all chemical species in a set of radiation-induced chemical reactions with homogeneous kinetics. It also calculates the concomitant changes in electrical conductivity and optical absorbance. As data, the program essentially requires the chemical reaction equations with rate constants, a list of the chemical species with their radiation yields, initial concentrations, equivalent conductances, absorptivities, and the dose rate as a function of time. The program is an improved version of one described in an earlier report written for a CDC-3600 system. The new features of the revised program, in particular, the possibility to treat reaction systems involving chain reactions and to study the effect of repetitive radiation pulses, are described, and detailed instructions are given for the use of the program. Two plotting programs to be used in connection with WR20 are also described. One creates a plot on a 780-Calcomp plotter, the other a plot on the printer.
Author (NSA)

N71-15106# Dow Chemical Co., Golden, Colo. Rocky Flats Div.
CALCULATIONS FOR PIPE INTERSECTIONS CONTAINING FISSILE SOLUTION
Deanne Dickinson 24 Jun. 1970 20 p refs
(Contract AT(29-1)-1106)
(RFP-1499) Avail: NTIS

Calculations of the effective neutron multiplication factor for complicated pipe intersection problems have been performed using the O5R Monte Carlo neutron transport code. Results are compared with experimental data and with the predictions of an earlier empirical model. Calculations for simple pipe intersections such as T's and crosses are also presented. An empirical model is formulated and its predictions compared with experimental and calculational data and with other model calculations.
Author (NSA)

N71-15116# Purdue Univ., Lafayette, Ind. Nuclear Structure Lab.
DIRECTIONAL CORRELATION MEASUREMENTS OF THE GAMMA RAYS EMITTED IN THE DECAY OF Tb 160
K. S. Krane and R. M. Steffen 1970 21 p refs
(Contract AT(11-1)-1748)
(COO-1748-49) Avail: NTIS

The decay of Tb-160 to levels in Dy-160 was investigated by measuring the gamma-gamma directional correlations using two 30 cc coaxial Ge(Li) detectors in conjunction with multi-channel coincidence and routing apparatus. A detailed analysis was performed in order to correct the effects of the measured correlations of Compton scattered radiation. The results of the sixteen measured directional correlations served to verify the current spin assignments, and in addition yielded values for the E2/M1 and M2/E1 multipole mixing ratios of the gamma transitions, given in terms of explicitly defined reduced matrix elements. The results are discussed in terms of collective rotational nuclear motion.
Author (NSA)

N71-15117# Indiana Univ. Bloomington.
LARGE ANGLE PROTON-PROTON ELASTIC SCATTERING AT INTERMEDIATE MOMENTA
H. A. Neal, B. B. Brabson, R. R. Crittenden, R. M. Heinz, R. C. Kammerud et al [1970] 36 p refs Presented at 15th Intern. Conf. on High Energy Phys., Kiev
(Contract AT(11-1)-2009)
(COO-2009-15; CONF-700806-38) Avail: NTIS

Differential cross sections were measured for large angle p-p elastic scattering at intermediate moments at the Argonne ZGS Accelerator. The measurements cover the momentum range 1.5 to 5.5 GeV/c and the angular region 40 < or = to theta sub cm < or = to 90 deg. The statistical accuracy of the data, presented in bins of 2 deg in theta sub cm, is typically + or − 4%. Fixed theta sub cm cross sections suggest slope changes near t = −.8 and −3 (GeV/c) sq. Optical and Regge pole model analyses of the data are presented.
Author (NSA)

N71-15118# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
PACIFIC NORTHWEST LABORATORY, DIVISION OF ISOTOPE DEVELOPMENT PROGRAMS Quarterly Report, May–Jul. 1970
J. E. Hansen, ed. Aug. 1970 47 p refs
(Contract AT(45-1)-1830)
(BNWL-1308-3) Avail: NTIS

Results are presented for the compatibility of Sm metal with containment materials. The materials showing the least interaction with Sm include Ta, Ta-10W, Ti, Zr, and TZM. Accomplishments on the NDT methods and device development program included the final construction and testing of the multielement transducer and cathode ray tube (CRT) readout systems, including a new contrast reversal readout technique. Nuclide tables containing the properties of 2000 nuclides and isomers were completed. A comparison of Pm-147 and Pu-238 as circulatory support heat sources indicates that Pu-238 is the more advantageous source, primarily due to the Pm-146 impurity and the longer half life of Pu-238. A feasibility demonstration of the seabed mineral exploration technology was conducted. This demonstration verified expectations that many of the precious elements can be measured at concentrations of a few ounces per ton.
Author (NSA)

N71-15119# California Univ., Berkeley. Lawrence Radiation Lab.
THE A2 AND THE 2(+) THE 2(+) NONET: CONSISTENCY OF DATA
Angela Barbaro-Galtieri Jun. 1970 27 p refs Presented at Exptl. Meson Spectry. Conf., Philadelphia, 1-2 May 1970
(Contract W-7405-eng-48)
(UCRL-19865; CONF-700525-7) Avail: NTIS

New data on the A2(+) meson fail to show the two peak structure seen in the A2(−) experiments of the CERN group. All the bubble chamber experiments on A2 production are reviewed and the new data are compared with the CERN data. The two parameter double pole formula used to fit the CERN data does not appear to explain the new data. Therefore the only way to reconcile the various experiments on the charged A2 is to assume the presence of two coherently produced resonances with J(P) = 2(+), with a phase depending on either the charge of the incoming beam, or the momentum transfer to the target proton, or the incident momentum, or all three. The K*(1420) and the f meson, members of the same 2(+) nonet as the A2, do not seem to show any structure consistent with the two parameter double pole formula.
Author (NSA)

N71-15120# California Univ., Berkeley. Lawrence Radiation Lab.
BUBBLE CHAMBER PHYSICS IN THE SEVENTIES
G. H. Trilling Jul. 1970 38 p refs Presented at the Intern. Conf. on Bubble Chamber Tech., Argonne, Ill., 10-12 Jun. 1970

(Contract W-7405-eng-48)
(UCRL-19870; Conf-700623-1) Avail: NTIS

Recent bubble chamber work is briefly reviewed including such topics as the decay properties of hyperons, neutrino interactions, electromagnetic interactions, baryon spectroscopy, boson spectroscopy, production mechanisms, and many-particle final states. Developments which may increase the capability of the bubble chamber are discussed including hybrid systems, track-sensitive targets, and large volume chambers. NSA

N71-15121# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
POSSIBLE TESTS FOR THE PRESENCE OF AN ISOTENSOR CURRENT
G. Domokos and P. Suranyi 18 Jun. 1970 10 p refs
(Contract AT(30-1)-4076)
(NYO-4076-8) Avail: NTIS

Sensitive tests are proposed to determine whether the electromagnetic current has an isotensor component. These tests are double pion photoproduction and electron−positron annihilation into 3 pion. NSA

N71-15122# Oregon Univ., Eugene.
EFFECT OF epsilon U SUP P = Q(+), I = O) RESONANCE ON POSITRON ELECTRON YIELDS PION(+) PION(−) gamma
A. Q. Sarker [1970] 10 p refs
(Contract AT(45-1)-2041)
(RLO-2041-42) Avail: NTIS

The product of the coupling constants, epsilon yields 2 pion and epsilon yields 2 photon is estimated from a superconvergent sum rule obtained from the helicity flip amplitude of pion-Compton scattering. It is then used to show that the contribution of epsilon(even-C) to the process, e(+)e(−) yields pion(+) pion(−) photon is about two orders larger than that when the pions are in odd-C states. Author (NSA)

N71-15123# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
OVERLAPPING RESONANCE MODEL OF DEEP INELASTIC ELECTRON SCATTERING
G. Domokos and S. Kovesi-Domokos 30 Jun. 1970 17 p refs
(Contract AT(30-1)-4076)
(NYO-4076-9) Avail: NTIS

It is suggested that deep inelastic electron scattering can be understood in terms of overlapping resonance contributions to the amplitude of virtual forward Compton scattering. The resonance contributions are calculated with the help of a semiempirical model of the hadron spectrum, under the assumption that the virtual resonance photoproduction matrix elements are universal functions of the photon energy divided by the resonance mass squared. An asymptotic expression for the structure function is derived and compared with the experimental data. The prediction of the model agrees well with the experimental results. Author (NSA)

N71-15124# Tokyo Univ. (Japan). Inst. for Nuclear Study.
CALCULATION OF THE SIZE SPECTRUM OF HORIZONTAL AIR SHOWERS BY MONTE CARLO METHOD
Motohiko Nagano Jun. 1970 34 p refs
(INSJ-121) Avail: AEC Depository Libraries

The expected size spectrum of horizontal air showers by muons as parents is calculated by means of Monte Carlo method by taking into account the showers produced by photons due to bremsstrahlung of muons and by hadrons emitted in the muon-nucleon interactions. Author (NSA)

N71-15125# Indiana Univ., Bloomington. Dept. of Physics.
PION(+) PROTON BACKWARD ELASTIC SCATTERING FROM 2.18 TO 5.25 GeV/c
Ronald Arden Sidwell [1970] 98 p refs
(Contract AT(11-1)-2009)
(COO-1009-14) Avail: NTIS

Differential cross sections are presented for pion-proton elastic scattering in the angular range −0.6 > approximately cos theta circular mil > approximately −0.98 at 15 incident positive pion momenta from 2.18 at 5.25 GeV/c and five incident negative pion momenta from 2.38 to 3.00 GeV/c. The positive pion proton angular from 2.38 to 3.00 GeV/c. The positive pion proton angular distributions rise steeply near 180 deg at all momenta. For laboratory momenta > approximately 2.75 GeV/c they show a minimum at u approximately −0.17 (GeV/c)squared and a broad maximum near u approximately −0.5 (GeV/c)squared, where u is the square of the four momentum transfer between the incoming pion and outgoing proton. The structure of the negative pion proton angular distributions undergoes a marked change in the momentum range studied. Author (NSA)

N71-15126# United Kingdom Atomic Energy Authority, Harwell (England). Atomic Energy Research Establishment.
METHODS OF COLLECTION AND ANALYSIS OF RADIOACTIVITY FROM DISTANT NUCLEAR TEST EXPLOSIONS
R. S. Cambray, E. M. R. Fisher, L. Salmon, and W. L. Brooks 1970 23 p refs
(AERE-R-5898) Avail: HMSO 4s; BISSO.90

The methods used for the collection and analysis of fallout samples from a worldwide network of sampling stations are summarized. Rainwater is collected by funnel and bottle. Airborne dust is sampled by filters near ground level and occasionally in the upper troposphere and lower stratosphere. The total beta activity is measured by simple counter arrangements and individual fission products by gamma ray spectrometry and radiochemistry. The operating instructions to rainwater collectors, the radiochemical analytical procedures, and the method of numerical analysis of gamma ray spectra are described. Author (NSA)

N71-15127# Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.
SUPPORT ACTIVITIES FOR CALIBRATION OF HIGH-INTENSITY FLASH X-RAY MACHINES
J. Stevens, R. H. Beers, and I. D. Contreras Jun. 1970 47 p refs Prepared for Sandia Corp., Albuquerque, N.Mex.
(Contract AT(29-1)-1183)
(EGG-1183-2230; S-479-R) Avail: NTIS

The work performed in support of a program to characterize the output of high intensity flash X-ray machines is described. A Compton magnetic spectrometer, used to measure the bremsstrahlung spectrum, is described; and a three element Compton diode (ratio detector) designed, fabricated, and calibrated for use in measuring the instantaneous energy of the electrons producing the bremsstrahlung, is discussed. Author (NSA)

N71-15128# Colorado Univ., Boulder. Dept. of Physics.
ALGEBRA USED BY DWUCK WITH APPLICATIONS TO THE NORMALIZATION OF TYPICAL REACTIONS
P. D. Kunz Jul. 1970 9 p refs
(Contract AT(11-1)-535)
(COO-535-613) Avail: NTIS

The computer program DWUCK, which calculates the scattering differential cross section in the zero range DWBA, is described. The equations used are given in full. Applications to inelastic scattering stripping, and pick-up reactions are illustrated. NSA

N71-15129# Istituto Universitario Navale, Naples (Italy).
MATHEMATICAL MODEL FOR UNDERSTANDING THE CROSS MODE EXCITATIONS IN DEE-DUMMY DEE STRUCTURES OF SYNCHRO-CYCLOTRONS

O. M. Bucci and G. Franceschetti 30 Apr. 1970 27 p refs Sponsored by CERN Prepared in cooperation with Naples Univ.
(CERN-70-13) Avail: AEC Depository Libraries

A mathematical model is proposed to facilitate the study of the cross-mode excitation in the Dee–Dummy Dee (D–DD) accelerating structure in synchrocyclotrons. Modes of the electromagnetic field in the D–DD structure, free resonances of the D–DD structure, and excitation of modes into the D–DD structure are considered. NSA

N71-15131# California Univ., Livermore. Lawrence Radiation Lab.
METHODS OF MODELING EJECTION WITH CONSIDERATION OF THE FORCE OF GRAVITY
V. N. Rodionov [1970] 13 p refs Transl. into ENGLISH from the Russian Presented at the Meeting on Tech. Aspects of Peaceful Uses of Nucl. Explosives, Vienna, 2–5 Mar. 1970
(UCRL-Trans-10476; CONF-700305-5) Avail: NTIS

An experimental unit for studying the formation of a crater due to expansion of gaseous explosion products following the process of rock crushing by direct waves and waves reflected from the free surface is described. The initial parameters of the cratering process are the depth and dimensions of the cavity and the pressure of gases inside it. The model of crushed rock is dry sand. The relative magnitude of the force of gravity was varied by reducing atmospheric pressure. An empirical dependence has been established between crater dimensions and the energy of gas in the cavity, depth and other parameters. The results of the model experiments show a good agreement with those of large TNT and nuclear explosions. Author (NSA)

N71-15132# Academia R. P. R., Bucharest. Institutul de Fizica Atomica.
METHOD FOR DETERMINING PARAMETERS OF ATOMIC STRUCTURE IN PLASMA RADIATION THEORY
Brindus Lucian 1970 20 p refs In RUMANIAN
(NP-18278) Avail: AEC Depository Libraries

The wave functions needed to calculate the matrix elements are obtained by the numerical solution of a system of coupled integral-differential equations on the basis of the Hartree–Fock method. Layzer's method, which involves the solution of a system of nonlinear algebraic equations, yields atomic screening parameters for the states defined by the LS coupling. A new method was developed for obtaining the atomic screening parameters without requiring computers for carrying out the calculations. The method may be used to determine these parameters for the excited states of inert gases, described by the jl coupling. It may be also used to calculate excitation cross sections, transition probabilities and photoionization cross sections for an atom with N electrons. The calculation was based on electron collision data and on analytical expressions. In plasma physics studies, the thermionic method was correlated with that based on the screening parameters in order to estimate the photoionization cross sections. Author (NSA)

N71-15133# California Univ., Livermore. Lawrence Radiation Lab.
EQUATION OF STATE OF H2 AND D2 BETWEEN 3 AND 10 cc/mole AND TO 10,000 K
Marvin Ross [1970] 14 p refs
(UCRL-50911) Avail: NTIS

A theoretical model was used to analyze the limited experimental data on molecular H2 and D2 and then to calculate the equation of state of these isotopes to 10,000 K and 3 cc/mole. The usefulness of shock-wave experiments in predicting the equation of state in the regions not covered by the experiments is analyzed. It is concluded that the most useful experiments will be those starting from the liquid and leading to the highest final temperatures, and not necessarily to the highest compressions. Author (NSA)

N71-15135# Pennsylvania State Univ., University Park. Whitmore Lab.
IONIZING COLLISION REACTION OF ELECTRONICALLY EXCITED ATOMS AND MOLECULES
F. W. Lampe [1969] 96 p refs
(Grant NSF GP-8065)
Avail: Issuing Activity

Various definitions are considered for the limits of the term chemi-ionization, used to describe ionization reactions that result from thermal collisions of electronically excited atoms or molecules. The reactions considered are restricted to ionization processes that are a result of thermal bimolecular collisions in which one or both of the collision partners is in an electronically excited state. Author

N71-15141# Australian National Univ., Canberra. Research School of Physical Sciences.
SCATTERING AND POLARIZATION OF NUCLEONS AND DEUTERONS
B. A. Robson Oct. 1970 126 p refs
(ANU-P/497) Avail: NTIS

A series of lectures are given on polarization and particle scattering. Polarization is defined and examples and uses of polarization are given. E.H.W.

N71-15145# Wake Forest Coll., Winston-Salem, N.C.
[ATOMIC MOBILITY IN SOLIDS] Progress Report, 1 Jun. 1969–31 Jan. 1970
31 Jan. 1970 12 p refs
(Contract AT(40-1)-2413)
(ORO-2413-25) Avail: NTIS

The atomic mobility in ionic crystals and silver solid solutions was studied by using optical absorption, dielectric loss, ionic thermocurrent, internal friction, and resistivity measurements. A Meechan–Brinkman analysis was performed on the deformation band in CaO. Isochronal decay curves of the deformation band in SrO were obtained. Attempts to obtain a deformation band for CaF2 were unsuccessful. From preliminary internal friction studies on MgO at 25 to 400 C the logarithmic decrement was found to have double-valued behavior as a function of strain amplitude. The kinetic recovery of defects in AgAu alloys at strains less than 2% and greater than 10% is discussed. NSA

N71-15146# California Univ., Berkeley. Lawrence Radiation Lab.
HIGH-ENERGY HADRON-DEUTERON SCATTERING
C. J. Joachain and C. Quigg 15 Jun. 1970 88 p refs
(Contract W-7405-eng-48)
(UCRL-19851) Avail: NTIS

Theoretical descriptions of hadron–deuteron scattering at high energies are reviewed. All the specific models have in common the Glauber approximation as their principal ingredient. Considerable effort is devoted to a discussion of forward elastic scattering, for which the theories have reached the highest degree of refinement. The modifications to the simple theory which have emerged from fine structure in experimental cross sections are detailed. The relation between the Glauber picture and Regge theory is analyzed, and the present incompleteness of both approaches is exposed. Brief remarks are made on the anomalous thresholds in energy variables which occur for loosely bound systems, such as the deuteron. Finally more basic generalizations of the Glauber method to include inelastic scattering of the projectile or of one of the constituent nucleons within the deuteron are discussed. A few specific experimental tests are listed. Author (NSA)

N71-15147# Institute of Nuclear Physics, Krakow (Poland).
ELECTRON CAPTURE TYPE DETECTOR: MODEL DNW-300/68 FOR GAS CHROMATOGRAPHY
J. Lasa and T. Owsiak 1970 12 p

(INP-700) Avail: AEC Depository Libraries

Basic parameters characterizing a new construction of the detector devoted to the detection of electron capturing components are presented. In the detector Ni-63 was used as the source of ionizing radiation. The special construction of the detector makes possible its permanent operation at temperatures up to 400 C. Author (NSA)

N71-15148# Skoda Works, Pilsen (Czechoslovakia). Nuclear Power Plants Div.

EXPERIENCE IN THE MANUFACTURE OF NEUTRON SOURCE SEALED BY WELD

J. Kott and A. Zbytovsky 1970 9 p

(ZJE-80) Avail: AEC Depository Libraries

A description is presented of the weld-sealed Ra-Be neutron source with an intensity of 10 million n/sec. The 4 pion source was developed and manufactured. Special emphasis is given to welding technology, equipment for transporting the source, and to the measurement of the source. Author (NSA)

N71-15149# Washington Univ., St. Louis, Mo. Dept. of Chemistry.

DELAYED PARTICLE SPECTROSCOPY Final Report

Paul L. Reeder 31 Aug. 1970 25 p refs

(Contract AT(11-1)-1608)

(COO-1608-8) Avail: NTIS

Research with the on-line mass spectrometer at the Washington University cyclotron is described. Relative cumulative yields and relative independent yields of isotopes from fission of uranium-238 and thorium-232 induced by helium-3 and helium-4 ions were measured. Also, attempts to obtain negative ion fission products from the on-line system are described. NSA

N71-15150# Oak Ridge National Lab., Tenn.

IMP ADIABATICITY

R. J. Colchin and E. A. Ferguson Aug. 1970 45 p Sponsored by AEC

(ORNL-TM-3121) Avail: NTIS

The adiabaticity of protons injected into the mirror-quadrupole fields of the IMP device is studied by computer orbit following. Trapped 20-keV protons were found to be adiabatic at full (20 kG) fields. For half-field operation, nonadiabaticities were observed only at the largest trapped radii. Author (NSA)

N71-15168# Washington Univ., Seattle.

ISOBARIC ANALOGUE RESONANCES IN PROTON ELASTIC AND INELASTIC SCATTERING

G. W. Bund and J. S. Blair 1969 50 p refs Sponsored by AEC

(RLo-1388-578) Avail: NTIS

The basic assumptions made are that the coupling of the open channels to compound nuclear states with isobaric spin $T0-1/2$ is simulated by a phenomenological complex potential acting in the entrance and exit channels and that internal mixing of the isobaric analogue state with complicated compound nuclear states is small. The fractional parentage expansions characteristic of (d,p) stripping reactions on the parent states are explicitly introduced. The elastic and inelastic partial widths and the total width for the analogue of the ground state of Pb-208 are studied for different optical potentials and partial agreement with experiment is obtained. Author (NSA)

N71-15178*# California Inst. of Tech., Pasadena. Hale Observatories.

ON THE MOTION AND RADIATION OF CHARGED PARTICLES IN STRONG ELECTROMAGNETIC WAVES. 1: MOTION IN PLANE AND SPHERICAL WAVES

James E. Gunn and Jeremiah P. Ostriker Oct. 1970 47 p refs

(Grant NGL-31-001-007; Contracts AF 49(638)-1555; NONR-220(47); Grants NSF GP-15911; NSF GP-9114 et al NSF GP-19887)

(NASA-CR-111535; OAP-221) Avail: NTIS CSCL 20H

The motion of test particles are studied in strong electromagnetic waves considering both plane and spherical wavefronts, both with and without radiative reaction. Various limiting cases are discussed. Initially low-energy particles dropped into a strong plane wave are accelerated in the propagation direction up to an energy proportional to B to the 2nd power while oscillating with a transverse energy proportional to B. In spherical waves particles injected very close to the source become phase locked with the driving wave and are accelerated in the manner described in earlier work; particles injected further out follow orbits like classical particles in a repulsive inverse cube force-field except that, for certain classes of initial conditions, an essentially random energy redistribution (of limited range) is possible. Author

N71-15179# Washington Univ., Seattle. Dept. of Nuclear Engineering.

THE MEASUREMENT OF DELAYED NEUTRON ENERGY SPECTRA Progress Report, 1 Feb. – 1 Aug. 1970

Gene L. Woodruff Aug. 1970 15 p refs

(Contract AT(45-1)-2225)

(RLO-2225-T-17-1) Avail: NTIS

Progress in the development of a system for the measurement of delayed neutron energy spectra is reported. The target irradiation system, data acquisition and storage, and data analysis are discussed. Proton-recoil ionization chambers are used. NSA

N71-15180# Princeton Univ., N.J. Joseph Henry Labs.

SPECTRAL FUNCTIONS FROM ELECTRON POSITRON ANNIHILATION

S. B. Treiman and A. Pais [1970] 10 p refs Prepared in cooperation with Rockefeller Univ.

(Contracts AT(30-1)-4204; AF 49(638)-1545)

(NYO-4204-2) Avail: NTIS

It is shown, on the basis of PCAC and current algebra notions, how spectral function information on the weak axial vector current and isovector electromagnetic current can be extracted from soft pion production in $e(+)-e(-)$ annihilations. Author (NSA)

N71-15185# Rochester Univ., N.Y. Dept. of Physics and Astronomy.

IMPROVED RECONSTRUCTION OF HIGH MOMENTUM TRACKS USING A DOUBLE PRECISION VERSION OF TVGP

W. Katz Jul. 1970 4 p refs

(Contract AT(30-1)-875)

(UR-875-315) Avail: NTIS

TVGP reconstruction of high momentum tracks using an IBM 360/65 computer is found to be sensitive to machine rounding errors. These rounding errors are significant for values of the momentum (in GeV/c) > or = to the length of the track (in cm). Conversion of TVGP into double precision gives excellent reconstruction results up to 1000 GeV/c. Author (NSA)

N71-15186# Oak Ridge National Lab., Tenn.

NUCLEAR SHIELDING CALCULATIONS STUDY NO. 07-1, NOTE 9: PHOTON SCATTERING, MONOENERGETIC ISOTROPIC POINT SOURCE, INFINITE MEDIUM [CALCULS DE PROTECTION NUCLEAIRE. NOTE NO. 9: DIFFUSION DE PHOTONS, SOURCE PONCTUELLE ISOTROPE MONOENERGETIQUE, MILIEU INFINI]

[1970] 63 p refs Transl. into ENGLISH of Min. des Armees, Paris, Report

(ORNL-tr-2349) Avail: NTIS

The details of a differential energy flux calculation in a photon scattering problem are given. The photon source is

monoenergetic, point shaped, and isotropic. The absorbing medium is assumed to be infinite. The method used for these calculations is a Monte Carlo method with exponential transformation. The mathematical and physical study is outlined. The calculations were performed on an IBM 7040 computer using the DIPHO code. NSA

N71-15187# Union Carbide Corp., Oak Ridge, Tenn. Computing Technology Center.
THE USE AND TESTING OF Al, Fe, Ni, Cu, AND Pb SECONDARY GAMMA-RAY PRODUCTION DATA SETS FROM THE POPOP4 LIBRARY
W. E. Ford, III and D. H. Wallace 1 Jul. 1970 169 p refs
(Contract W-7405-eng-26)
(CTC-20) Avail: NTIS

Aluminum, iron, nickel, copper, and lead secondary gamma-ray yield data sets for gamma-rays resulting from neutron capture and inelastic scattering reactions were evaluated by comparing calculated secondary gamma-ray pulse height spectra with spectra measured. The calculated spectra were obtained by using a discrete ordinates transport code to calculate the secondary gamma-ray angular flux resulting from the exposure of slabs of the materials of interest to bare, cadmium-filtered, boron-filtered, and thermal neutron beams from the TSR-2 reactor and then folding the angular flux into pulse height spectra. The FORTRAN-4 codes UNFOLD, A Sample Simple Coupling Code, and POPOP4 Library Tape Meker are described. UNFOLD folds the calculated intensity of photons striking a NaI(Tl) detector into secondary gamma-ray pulse height spectra and compares calculated and measured spectra. Author (NSA)

N71-15188# Institute of Radiation Physics, Helsinki (Finland).
ARRANGEMENT FOR READ-OUT OF LUMINESCENT DOSIMETERS
M. Toivonen Jul. 1969 16 p refs
(SFL-A13) Avail: AEC Depository Libraries

A reader for luminescence dosimeters is described. The equipment comprises separate heads for stimulating radiophotoluminescence and thermoluminescence and a common integrating unit for measurement of the photomultiplier output charge. The performance of the apparatus has been tested with phosphate glasses and with $Li_2B_4O_7$:Mn thermoluminescent powder. Furthermore the low dose performances with LiF:Cu, Ag and LiF:Mg, Ti luminophors have been investigated. Author (NSA)

N71-15189# Oak Ridge National Lab., Tenn.
NUCLEAR SHIELDING CALCULATIONS STUDY NO. 07-1, NOTE 50: NEUTRON REFLECTION AND TRANSMISSION IN SHIELDS, MONTE CARLO METHOD [CALCULS DE PROTECTION NUCLEAIRE ETUDE NO. 07-1, NOTE NO. 50: REFLEXION ET TRANSMISSION DES NEUTRONS DANS LES BLINDAGES, METHODE DE MONTE CARLO]
[1970] 45 p refs Transl. into ENGLISH of Min. des Armees, Paris, Report
(ORNL-tr-2368) Avail: NTIS

A calculation by the Monte Carlo method (code name ALTRAN) of the neutron flux and dose through two flat plates of any given material is described, with application to polyethylene covered steel shields. Angular flux and dose distribution for reflected and transmitted neutrons were obtained. NSA

N71-15201# Massachusetts Univ., Amherst.
STUDY OF NEGATIVE SIGMA HYPERON PLUS PROTON YIELDS LAMBDA HYPERON PLUS NEUTRON AND NEUTRAL SIGMA HYPERON PLUS NEUTRON REACTIONS USING POLARIZED NEGATIVE SIGMA HYPERON WITH MOMENTUM FROM 0 TO 550 MeV/c
D. Stephen, S. S. Hertzbach, R. R. Kofler, G. W. Meisner, and S. S. Yamamoto 1970 15 p refs
(Contract AT(30-1)-3651)
(NYO-3651-14) Avail: NTIS

Negative Sigma hyperon + proton yields Lambda hyperon + neutron and neutral Sigma hyperon + neutron interactions were studied at 0 equal to or less than P sub Sigma(-) which is equal to or less than 550 MeV/c. The capture ratio r is measured to be .460 plus or minus .011 at P sub Sigma = 0. The negative Sigma hyperon - Lambda hyperon polarization correlation indicates dominant 3S1 state at P sub Sigma = 0. The cross sections indicate enhancements at P sub Sigma = 440 and P sub Sigma = 570 MeV/c. Author (NSA)

N71-15202# Iowa State Univ. of Science and Technology, Ames.
DECAY OF Se 73m,g, Ge 75m, AND Ge 77m,g
Ralph Dennis Meeker (Ph.D. Thesis) May 1970 97 p refs
(Contract W-7405-eng-82)
(IS-T-365) Avail: NTIS

The decay of Se-73m,g, Ge-75m, and Ge-77m,g were investigated using Ge(Li) gamma singles measurements, Ge(Li)-Ge(Li) and NaI(Tl)-Ge(Li) coincidence measurements, and delayed coincidence measurements. A decay scheme for Se-73m,g was constructed using high-resolution gamma singles measurements and Ge(Li)-Ge(Li) and NaI(Tl)-Ge(Li) coincidence measurements. Branching ratios and log(ft) values for decay to the levels of As-73 were calculated. Experiments on the decay of Ge-75m give a value of 139.8 + or - 0.1 keV for the isomeric transition and set upper limits on the direct beta decay of this 7/2(+) isomer to low-lying positive parity levels in As-75. The lifetime of the 632 keV 5/2(+) level in As-77 was measured to be 75 + or - 15 psec using gamma rays emitted following the decay of Ge-77g. Two low-spin negative parity levels were located in the As-77 level scheme using gamma rays following the decay of Ge-77m, including a first excited state at 195 keV with I sup pi = 1/2(-). The experimental data for the levels of As-73,75,77 were compared with the predictions of the Coriolis coupling model. Author (NSA)

N71-15203# Sandia Corp., Albuquerque, N.Mex.
STARK-PROFILE CALCULATIONS FOR THE FIRST FOUR HYDROGEN BALMER LINES
R. A. Hill and Paul Kepple (Naval Res. Lab., Wash., D.C.) Sep. 1970 55 p refs Sponsored by AEC
(SC-M-70-564) Avail: NTIS

Stark-broadened line profiles for the first four hydrogen Balmer lines were computed for electron densities in the range 10 to the 13th power equal to or less than N sub e equal to or less than 10 to the 19th power cm/3 and for electron temperatures in the range 10,000 equal to or less than T sub e equal to or less than 4 x 10,000 K. These profiles have been calculated both with and without the effects of inelastic collisions between perturbing electrons and radiators. Fractional-intensity widths of these profiles were computed and tabulated as a function of electron density and temperature. Author (NSA)

N71-15206# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.
SOME NEW THERMAL-NEUTRON CAPTURE-GAMMA YIELDS FOR THE WANL POINT LIBRARY
S. A. Fody Jul. 1970 34 p refs Sponsored by AEC
(WANL-TME-2713) Avail: NTIS

Thermal-neutron capture-gamma yield tables are presented for the following elements: H, Be, C, N, Na, Mg, Al, Si, Ti, Cr, Mn, Fe, Ni, Cu, Zn, Zr, Nb, Mo, Ag, Cd, Gd, Hf, Ta, W, Au, and Pb. NSA

N71-15209# Oregon Univ., Eugene. Dept. of Physics.
DEADTIME CORRECTION FOR PULSED BEAMS
K. Bartleson and D. K. McDaniels [1969] 9 p refs Sponsored

by AEC
(RLO-1925-42) Avail: NTIS

A method is presented for making deadtime corrections for nonparalyzable electronic devices for the case of counting events from a pulsed beam of finite time spread and a counting interval which encompasses only a fraction of the interval between pulses. Author (NSA)

N71-15212# Purdue Univ., Lafayette, Ind. Nuclear Structure Lab.
RESEARCH IN NUCLEAR PHYSICS Progress Report, 1 Jun. 1969 - 31 May 1970
R. M. Saffen 15 Jun. 1970 89 p refs
(Contract AT(11-1)-1746)
(COO-1746-39; PR-3) Avail: NTIS

Installation of the Purdue fn-tandem van de Graaff, operation of the tandem accelerator, experimental instrumentation for the tandem accelerator, forbidden beta transitions, ultrashort lifetime measurements, and the nuclear theory are reviewed. Nuclear reactions, coulomb excitation, angular correlation, and hyperfine fields are also studied. J.A.M.

N71-15217# General Electric Co., Sunnyvale, Calif. Breeder Reactor Development Operation.
ENDRUN-1: A COMPUTER CODE TO GENERATE A GENERALIZED MULTIGROUP DATA FILE FROM ENDF/B
B. A. Hutchins and L. N. Price 1970 144 p refs
(Contract AT(04-3)-189)
(GEAP-13592) Avail: NTIS

The ENDRUN-1 program, which calculates multigroup constants from ENDF/B data, is described. The problem and the method of solution are discussed in detail. A sample problem is solved as an illustration. The program is written in FORTRAN 4 except for input and output routines. The program was written for the GE 635 computer. NSA

N71-15228# Princeton Univ., N.J.
DIRECT MEASUREMENT OF n-p AND n-d TOTAL CROSS SECTIONS FROM 700 MeV/c TO 2900 MeV/c
R. E. Mischke, T. J. Devlin, R. Ehrlich, W. Johnson, J. Norem et al Aug. 1970 9 p refs Presented at 15th Intern. Conf. on High Energy Phys., Kiev, 1970 Prepared in cooperation with Rutgers Univ., New Brunswick, N.J.
(Contract AT(30-1)-4159; Grants NSF GP-14703; NSF GU-1592)
(PURC-4159-7; Conf-700806-32) Avail: NTIS

Neutron-proton and neutron-deuteron total cross sections were measured directly at the Princeton-Pennsylvania Accelerator using time of flight to determine the incident neutron energy. The results cover the region from 700 MeV/c to 2900 MeV/c with accuracy of 0.8%. The effect of the $D^0(2180)$ is clearly seen. Comparisons are made with p-p and p-d measurements in the same energy range. Author (NSA)

N71-15229# Sandia Corp., Albuquerque, N.Mex.
SCATTERING BY IMPERFECTLY CONDUCTING SPHERES
Ronald W. P. King (Harvard Univ., Cambridge, Mass.) and Charles W. Harrison, Jr. Jul. 1970 42 p refs Sponsored in part by AEC
(Contract F19628-68-C-0030)
(SC-R-70-4277) Avail: NTIS

Numerical values of the backscattering and forward scattering cross sections of spheres are given over wide ranges of the radius, the conductivity, and the permittivity including both positive and negative values. The angle of the electric field in the forward and backward directions is also represented. Author (NSA)

N71-15230# Iowa State Univ. of Science and Technology, Ames.
THE RADIOACTIVE DECAY OF Re 190 AND ISOMER RATIO MEASUREMENTS IN PHOTONUCLEAR REACTIONS
Peter Eugene Haustein (Ph.D. Thesis) 1970 113 p refs
(Contract W-7405-eng-82)
(IS-T-363) Avail: NTIS

The decay of the ground state of Re-190 (3.1 min) was investigated using Ge(Li) and scintillation detectors. Sources were prepared by the reaction Os-192(photon,np) Re-190. Seventeen gamma transitions following the 100% beta branch to the 1387-keV level of Os-190 were observed and placed into a decay scheme based on the known levels of Os-190. A previously unreported 432-keV transition depopulating the 1387-keV level was observed. Beta measurements yielded an end-point energy of 1.8 + or - 0.2 MeV for Re-190. Log ft calculations indicated that Re-190 has a spin between 2 and 4 and negative parity. Experiments on electron capture decay of Ir-190(12 day) into the Os-190 levels confirmed these results. The previously reported 2.8 hr Re-190 isomer was not observed. Author (NSA)

N71-15234# Chicago Univ., Ill.
ATTEMPT AT A REGGE POLE-REGGE CUT DESCRIPTION OF HIGH ENERGY pion NUCLEON SCATTERING
Alan C. Ferber [1970] 13 p refs
(Contract AT(11-1)-264)
(EFI-70-42; COO-264-555) Avail: NTIS

An attempt is made to fit near forward differential and the full known range of total pion nucleon cross sections by a Regge pole-Regge cut model. Possible explanations for the failure of this are discussed. Author (NSA)

N71-15235# Washington Univ., Seattle.
ROLE OF THE MOESSBAUER EFFECT IN SOLID STATE STUDIES AT HIGH PRESSURE
Robert L. Ingalls [1970] 33 p refs
(Contract AT(45-1)-2225)
(RLO-2225-T-12-1) Avail: NTIS

This lecture concentrates on general and fundamental relationships between the nucleus and surrounding electrons as well as between the Mossbauer atom and its neighbors. The atomic parts of the various electric and magnetic hyperfine interactions are discussed, as well as lattice dynamics and relation. Examples, including high pressure experiments, are given with emphasis on Fe-57. NSA

N71-15236# Columbia Univ., Irvington, N.Y. Nevis Labs.
K SUB L - K SUB S REGENERATION AMPLITUDE IN COPPER AT 2.5 GeV/c AND CP NON-INVARIANCE
Sheldon Bennett (Ph.D. Thesis) 1970 131 p refs
(Contract AT(30-1)-1932)
(NEVIS-184; CU-288; R-720) Avail: NTIS

The phase, phi sub f = Arg(1(f - f bar)/p), is determined from the time dependence of the charge symmetry in the decay K yields e(+ or -) + pion(- or +) + neutrino following passage of K sub L beam through 30.5 cm of converter. The value of phi sub f is obtained on the basis of 797,000 events. An alternative value of phi sub f is obtained from cross-section data and the value of absolute (f - f bar)/p. Author (NSA)

N71-15237# Oak Ridge National Lab., Tenn.
LOW-ENERGY ELECTRON ATTACHMENT TO POLYATOMIC MOLECULES AND NEGATIVE ION LIFETIMES
Patrick Marc Collins (Ph.D. Thesis - Tenn. Univ., Knoxville), L. G. Christophorou, and J. G. Carter Sep. 1970 153 p refs
(Contract W-7405-eng-26)
(ORNL-TM-2614) Avail: NTIS

Nondissociative and dissociative low energy electron attachment processes were studied in polyatomic molecules using a time-of-flight mass spectrometer. The first variation with incident

electron energy of the mean autoionization lifetime of a long-lived parent negative ion was found. Mean autoionization lifetimes were also measured for the negative ions of azulene, cinnamaldehyde, o-,m-, and p-nitrotoluene, sulfur hexafluoride, and hexafluoroacetone. Electron attachment cross sections for the formation of p-benzoquinone, 1,4-naphthoquinone, and azulene were measured. Estimates of the electron affinities in both the ground and excited states were made for p-benzoquinone and azulene, and in the ground state for 1,4-naphthoquinone. Dissociative electron attachment processes were studied in the alkyl bromides. Experimental data are presented which indicate certain diatomic-like characteristics of dissociative electron attachment to the alkyl bromide systems. Author

N71-15238# Argonne National Lab., Ill.
INELASTIC ELECTRON SCATTERING IN NOBLE GAS ATOMS [NEUPRUGOE RASSEYANIE ELEKTRONOV NA ATOMAKH BLAGORODNYKH GAZOV]
M. Ya. Amusya et al 1970 53 p refs Transl. into ENGLISH of Akad. Nauk SSSR, Leningrad, Preprint No. 261 In ENGLISH and RUSSIAN
(LIB-TR-28; AEC-tr-7173) Avail: NTIS

The differential cross sections for inelastic scattering of electrons with energies of up to 10 keV with small energy losses are investigated for atoms of Ne, Ar, Kr, and Xe. The calculation is performed in the Born approximation, and the Herman–Skillman function is used for the ejected electron. It is shown that for incident-electron scattering angles of less than 6 deg the principal contribution to the differential cross section is made by the dipole transition 1 yields 1 + 1 of the atomic electron. However, the form of the cross section is largely dependent on the contribution of transitions of other multipolarities, whose behavior is studied in detail. The data obtained are in qualitative agreement with experiment. The reasons for qualitative disagreement between theory and experiment are analyzed. Author (NSA)

N71-15239# Iowa State Univ. of Science and Technology, Ames. Ames Lab.
A QUANTUM ELECTRODYNAMICS FOR VECTOR MESONS
Robert Henry Tucker (Ph.D. Thesis)
(Contract W-7405-eng-82)
(IS-T-392) Avail: NTIS

A quantum-electrodynamics for vector mesons is constructed in which the vector meson is described by a six-component column matrix satisfying a single equation of motion with no auxiliary conditions. The S-matrix is derived directly from Green function solutions of the equations of motion rather than from Dyson's equation to avoid an interaction Hamiltonian which contains an infinite number of surface terms. In the reduction of the S-matrix terms appear which do not correspond to Feynman-type terms but which vanish if only regularized integrals are used. The Feynman rules are then identical in form to the rules for scalar electrodynamics. A distinct calculational advantage of this theory is that all components of Fock-space operators are treated on equal footing and create and destroy particles in definite energy and polarization states. Trace theorems for the covariantly defined spin-one matrices are given to further facilitate calculations. Author (NSA)

N71-15240# Chicago Univ., Ill.
REMARKS ON THE BETA DECAY OF HYPERONS
Reinhard Oehme, Roland Winston, and Augusto Garcia Aug. 1970 14 p refs
(Contracts AT(11-1)-264; AT(11-1)-1701)
(COO-264-548; COO-1701-11; EFI-70-31) Avail: NTIS

The formulas for spin and angular correlations in hiperon beta-decay are brought into forms which can give specific information about the character of possible deviations from the universal SU(3) scheme. The usefulness of the proposed combinations is discussed qualitatively. Author (NSA)

N71-15241# Stanford Linear Accelerator Center, Calif.
TWO-MILE ACCELERATOR PROJECT Quarterly Status Report, 1 Apr.–30 Jun. 1970
Sep. 1970 78 p refs
(Contracts AT(04-3)-400; AT(04-3)-515)
(SLAC-126; QSR-31) Avail: NTIS

A status report on the Stanford Linear Accelerator Project covering the period April 1, 1970 to June 30, 1970 is presented. Topics included are accelerator and research area operations, accelerator and research area equipment development, and physics research equipment development. Author (NSA)

N71-15253*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN EFFICIENT METHOD OF ENERGY PROJECTION
William F. Ford and Richard C. Bosley [1970] 16 p refs Presented at Winter Meeting of the Am. Phys. Soc., Stanford, Calif., 28-31 Dec. 1970
(NASA-TM-X-52943) Avail: NTIS CSCL 20H

The standard methods of projecting energy spectra from Hartree-Fock intrinsic wave functions become very time consuming as the model space is enlarged. One of these methods, however, can be revised so as to minimize storage and handling requirements. A careful description of the technique is presented for the general case, together with sections concerning simplifications resulting from certain nuclear symmetries, and suggestions related to efficiency and accuracy in the actual calculation. Author

N71-15254# Maryland Univ., College Park. Dept. of Physics and Astronomy.
PION PRODUCTION AND THE TWO-NUCLEON INTERACTION
Dean Zollman Jul. 1970 32 p refs Sponsored in part by AEC
(ORO-3765-27; TR-71-008) Avail: NTIS

The distorted-wave Born approximation, justified in a previous study, is applied to pion production in proton–proton collisions. The production amplitude is studied as a function of the phenomenological two-nucleon potential used to describe the proton-proton interaction. For selected possible experiments it is shown that the pion production amplitude depends on which phenomenological potential is used to describe the two-nucleon interaction. Author (NSA)

N71-15255# Iowa State Univ. of Science and Technology, Ames.
THE RADIOACTIVE DECAY OF Ho 168 AND Ho 169
Peter Eugene Haustein (M.S. Thesis) 1970 37 p refs
(Contract W-7405-eng-82)
(IS-T-364) Avail: NTIS

Gamma rays accompanying the beta decay of Ho-168(3.3 min) and Ho-169(4.8 min) were investigated using Ge(Li) detectors. Sources were prepared by the reactions Er-170(gamma,np)Ho-168 and Er-170(gamma,p)Ho-169 from targets of isotopically enriched (Er-170)203(>98%) and from erbium metal of natural isotopic distribution. Eight gamma transitions were observed in the Ho-168 decay and 21 transitions in the Ho-169 decay. Several additional weak, short lived gamma rays (>1 MeV) were observed that could not be definitely assigned to either activity due to their similar half lives. Gamma decay schemes are proposed for these two activities based on previously deduced energy level structure in Er-168 and Er-169. The decay of Ho-168 occurs primarily to the 2(+) and 3(+) members of the K = 2, gamma-vibrational band of Er-168. The decay of the Ho-169 ground state assigned to the 7/2(−)(523) Nilsson state occurs primarily to the first two members of the 5/2(−)(523) rotational band in Er-169. The gamma decay pattern of the 5/2(−)(523) rotational states to lower lying bands is discussed. Author (NSA)

N71-15261# California Univ., Berkeley. Lawrence Radiation Lab.
ELECTRONIC DENSITIES OF STATES FROM X-RAY

PHOTOELECTRON SPECTROSCOPY

C. S. Fasley and D. A. Shirley Jan. 1970 58 p refs Presented at Symp. on Electron. Density of States, Gaithersburg, Md.
(Contract W-7405-eng-48)
(UCRL-18953) Avail: NTIS

In X-ray photoelectron spectroscopy, a sample was exposed to low energy X-rays (approximately 1 keV), and the resultant photoelectrons were analyzed with high precision for kinetic energy. After correction for inelastic scattering, the measured photoelectron psectrum reflected the valence band density of states, as well as the binding energies of several core electronic levels. All features in this spectrum were modulated by appropriate photoelectric cross sections. Author

N71-15266# IIT Research Inst., Chicago, Ill.

SCAVENGING STUDY OF SNOW AND ICE CRYSTALS Quarterly Progress Report, 1 May – 31 Jul. 1970

Sudesh K. Sood 10 Aug. 1970 18 p refs
(Contract AT(11-1)-578)
(IITRI-C-6105-12) Avail: NTIS

The experimental equipment which was assembled and used successfully to grow ice crystals by water vapor condensation is described. A theoretical analysis of the capture of aerosol particles by growing ice crystals was made. Reasonable agreement has been found to exist between theoretical predictions and the experimental data in the literature. Author (NSA)

N71-15273# Vanderbilt Univ., Nashville, Tenn.

NUCLEAR STRUCTURE OF Pd 110 AND Cd 116 VIA THE (p,p') AND (p,p' GAMMA) DIRECT REACTIONS

James Alan Deye (Ph.D. Thesis) Aug. 1970 174 p refs Sponsored by AEC
(TID-25477) Avail: NTIS

An investigation was made of the degree to which Pd-110 and Cd-116 exhibit phonon character. Inelastic proton scattering and proton-gamma coincidence experiments were carried out. The collective-vibrational nuclear model and the direct-interaction model are discussed in relation to this work. The cross sections for excitation of the states in the two-phonon region were compared to the predictions of the direct-interaction coupled-channel theory. Quite acceptable fits to the experimental cross sections were achieved by assuming some one-phonon admixture in these predominantly two-phonon states. NSA

N71-15274# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.

NONLINEAR BEHAVIOR OF THE ONE-DIMENSIONAL BEAM PLASMA SYSTEM

Glenn Joyce, Georg Knorr, and Thomas Burns 1970 21 p refs
(Contract AT(11-1)-2059)
(COO-2059-2) Avail: NTIS

The effect of a beam of electrons on a Maxwellian plasma is studied by integrating numerically the Vlasov equation in one dimension. The solution is carried past the point of maximum electrostatic energy. After reaching its maximum value, the electrostatic energy fluctuates about its maximum. Some modes that are linearly stable grow due to mode coupling with the unstable modes. The relative amount of energy in the fastest growing mode is shown to depend on the periodicity length of the system. Author (NSA)

N71-15280# California Univ., Berkeley. Lawrence Radiation Lab. Dept. of Physics.

THE REACTION K(+)N YIELDS K°N IN THE ISOSPIN-0 CHANNEL NEAR THRESHOLD

A. A. Hirata, G. Goldhaber, V. H. Seeger, G. H. Trilling, and C. G. Wohl Apr. 1970 6 p refs Presented at the Intern. Conf. on Hyperon Resonances, Durham, N.C., 24–25 Apr. 1970
(Contract W-7405-eng-48)
(UCRL-19774; CONF-700416-8) Avail: NTIS

A discussion of the isospin-0 K(+) + N yields K + N + pion channel is presented based on K(+) + d data. The results show that above the K^0N threshold, at 1.080 GeV/c, most of the I = 0 K pion N production proceeds via the K^0N channel. The K^0 production and decay angular distributions indicate the presence of several partial waves even near threshold and suggest that the main production mechanism is t-channel pion exchange. The energy dependence of the cross sections and the production and decay angular distributions are discussed. NSA

N71-15281# Bettis Atomic Power Lab., Pittsburgh, Pa.

GRAMP: A PROGRAM TO GENERATE REICH AND MOORE PARAMETERS FOR MULTILEVEL UNRESOLVED RESONANCES

Mark Goldsmith May 1970 14 p refs
(Contract AT(11-1)-GEN-14)
(WAPD-TM-935) Avail: NTIS

GRAMP randomly generates Reich and Moore parameters for multilevel unresolved resonances of fissile isotopes. Parameters are calculated for two spin states of the compound nucleus. Associated with each of these states are two open fission channels. Punched card output which may be used directly as RECAP-0 input is available on option. NSA

N71-15282*# National Aeronautics and Space Administration. Lewis Research Center, Celveland, Ohio.

A COMPARISON OF DWBA AND COUPLED CHANNELS IN THE 2s–1d SHELL

R. J. Ascuitto (Yale Univ.), Richard C. Braley, and William F. Ford [1970] 12 p refs Presented at Am. Phys. Soc. Meeting, Stanford, Calif., 28–31 Dec. 1970
(NASA-TM-X-52935) Avail: NTIS CSCL 20H

The success of the Hartree-Fock model in explaining the structure of nuclei in the lower half of the 2s-1d shell has created considerable interest in studies of the low-lying states of these nuclei by means such as inelastic nucleon scattering. These states are quite collective and therefore strongly excited, suggesting the need for a coupled channel analysis. This may not be necessary for all levels, however. In order to make a meaningful comparison of the coupled channel and DWBA treatments, it is necessary to adjust the DWBA optical model parameters so that both methods predict the same elastic cross section. Such a program was carried out for the scattering of protons from Ne-20 and Mg-24, using nuclear wave functions obtained from Hartree-Fock studies. The results tend to confirm conclusions drawn in earlier investigations using a macroscopic model. Author

N71-15283# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PROJECTED HARTREE-FOCK SPECTRA WITH WOOD-SAXON BASIS FUNCTIONS

Richard C. Braley and William Ford [1970] 9 p refs Presented at the Winter Meeting of the Am. Phys. Soc., Stanford, Calif. 28–31 Dec. 1970
(NASA-TM-X-52944) Avail: NTIS CSCL 20H

The results of an investigation of intrinsic Hartree-Fock spectra and projected nuclear properties, such as E2 rates and inelastic scattering cross sections, when basis functions with Wood-Saxon radial dependence are used were reported previously. It was found that predicted values of properties sensitive to the long range behavior of the wave functions were improved by the use of a Wood-Saxon basis. Since the basis functions are normalized to unity, the short-range behavior of the wave function, and hence the energies, should be affected. This point is investigated by

comparison of projected Hartree-Fock spectra using basis functions having harmonic oscillator and Wood-Saxon radial dependence. Author

N71-15288# Rensselaer Polytechnic Inst., Troy, N.Y. Div. of Isotopes Development.
STUDY OF IMPROVED ISOTOPE EXCITED LIGHT SOURCE TECHNIQUES Final Report
P. Harteck and S. Dondes Jan. 1970 18 p refs
(Contract AT(30-1)-3816)
(RPI-3816-4) Avail: NTIS

Using polonium-210 alpha particles to irradiate helium-nitrogen gas mixtures (nitrogen concentrations 0.1 to 0.001%), an intense emission of the molecular nitrogen ion, (first negative system) was produced; the 0.1 line at 4278 A in the violet being most intense to the eye. The strongest band, at 3914 A was not in the visible range but provided the most intense emission as recorded by the 931 photomultiplier which has its maximum response at 4000 A. Similarly, the polonium-210 alpha irradiation of pure neon gas produced an intense emission in the red. By using aluminum foil or coating the inner glass with a highly reflecting surface, the apparent brightness could be increased by a factor of 4 or 5 times that of a standard source using 1 curie of tritium. Since these gas systems are inert, they are not consumed with time nor do they react with the radioisotope or the container and therefore the lifetime of the emission will simply depend upon the lifetime of the radioisotope. Author (NSA)

N71-15289# IIT Research Inst., Chicago, Ill. Technology Center.
SCAVENGING STUDY OF SNOW AND ICE CRYSTALS Quarterly Progress Report, 1 Nov. 1969 – 31 Jan. 1970
Sudesh K. Sood and Meryl R. Jackson 15 Jan. 1970 25 p refs
(Contract AT(11-1)-578)
(IITRI-C-6105-10) Avail: NTIS

Scavenging efficiency of naturally precipitating snow and ice crystals for 0.863 micron latex singlets and doublets has been studied. The effect of crystal habit and size on scavenging efficiency has been determined using an electron microscope. Charge measurements on snow and ice crystals were continued. Author (NSA)

N71-15290# Oregon Univ., Eugene.
ON A MODEL OF EPSILON YIELDS 2 GAMMA AND DELTA YIELDS 2 GAMMA DECAYS
A. Q. Sarker 1970 10 p refs
(Contract AT(45-1)-2041)
(RLO-2041-41) Avail: NTIS

A model of DeCelles and Goehl for epsilon yields 2 gamma decay is generalized so as to give the correct SU(3) symmetric result for both epsilon yields 2 gamma and delta yields 2 gamma. The question of symmetry breaking is also discussed. Author (NSA)

N71-15294# Purdue Univ., Lafayette, Ind. Dept. of Physics.
DETERMINATION OF FIRST FORBIDDEN BETA MATRIX ELEMENTS FROM ANGULAR CORRELATION DATA
Paul C. Simms [1970] 15 p refs Presented at Conf. on Angular Correlations in Nucl. Disintegration, Delft, Netherlands Sponsored by AEC
(COO-1746-44; (CONF-700807-2) 700-807-2) Avail: NTIS

A method of the extraction of first-forbidden beta matrix elements from angular correlation data is discussed. Some examples are given. NSA

N71-15295# California Univ., Livermore. Lawrence Radiation Lab.
TIBRO-GENERAL
Richard Knox 19 Aug. 1970 61 p refs Sponsored by AEC
(URCL-50910) Avail: NTIS

TIBRO-GENERAL is a modified version of a well-established code frequently used to calculate the precise trajectories of charged particles in dc magnetic fields. It is faster, easier to use, and more versatile than its predecessors. The TIBRO-GENERAL computer program, its basic operational elements and characteristics, and the mathematical model upon which it is based are described. TIBRO-GENERAL is written in FORTRAN 400 language and can be used directly on Control Data Corporation 6600 and 7600 computers. Few changes are needed to convert this program to FORTRAN 2 language. Author (NSA)

N71-15298# Wisconsin Univ., Madison. Dept. of Nuclear Engineering.
SCATTERING PROBABILITY OF FAST TEST PARTICLES IN A PLASMA
A. A. Husseiny and H. K. Forsen 1970 20 p refs Sponsored by AEC
(COO-1726-52) Avail: NTIS

An effective total cross section is calculated for elastic scattering of a monoenergetic beam of test particles in a plasma of arbitrary velocity distribution. Closed form solutions are obtained for the special case of Maxwellian field particles, taking into account small angle scattering. The results are compared with those obtained using the Debye cutoff technique, and it is shown that such an arbitrary cutoff can lead to erroneous results in the effective cross section and it can lead to different conclusions with regard to the relative importance of plasma ions and electrons in test particle scattering. Author (NSA)

N71-15300# United Kingdom Atomic Energy Authority, Harwell (England). Materials Physics Div.
XERORADIOGRAPHY AND RELATED TOPICS
V. M. Kirk Jul. 1970 13 p refs
(AERE-Bib-173) Avail: AEC Depository Libraries; HMSO 2s 6d; BIS $0.50

Seventy-one papers on xeroradiography are listed from 1938 onwards. Abstracts of some of the papers are included. NSA

N71-15325# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
THE SIGNAL-TO-NOISE RATIO FROM A COMPACT CYCLOTRON IN A PRECISION TIME-OF-FLIGHT SPECTROMETER. PART 1: (x,n) REACTIONS [ZUM SIGNAL-ZU-RAUSCH-VERHAELTNIS AN EINEM PRAEZISIONS-LAUFZEIT-SPEKTROMETER MIT SCHWENKBAREM ZYKLOTRON. TEIL 1: (x,n)-REAKTIONEN]
R. Jahr Mar. 1970 15 p refs In GERMAN; ENGLISH summary
(PTB-2/70) Avail: AEC Depository Libraries

A precision time-of-flight spectrometer is proposed, in which an incident charged particle beam from a compact cyclotron can be turned around the target, while the time-of-flight path for measuring the emerging neutrons remains fixed. The signal-to-noise ratio for neutrons which reach the detector situated at the end of the time-of-flight path is discussed. Author (NSA)

N71-15333# Ballistic Research Labs., Aberdeen Proving Ground, Md. Nuclear Effects Lab.
NEUTRON ACTIVATION CROSS SECTIONS FOR SOME ISOTOPES OF RUTHENIUM, PALLADIUM, INDIUM, TIN, AND IRIDIUM
Judith K. Temperley and Donald E. Barnes Aug. 1970 38 p refs
(AD-713404; BRL-1491) Avail: NTIS CSCL 20/6

Fast-neutron activation cross sections for isotopes of ruthenium, palladium, indium, tin, and iridium have been measured relative to the 56Fe(n,p)56Mn cross section. Powdered metallic samples of natural-isotopic-abundance Ru, Pd, In, Sn, and Ir were irradiated with (14.1 plus or minus 0.5) - MeV neutrons. The activities produced were determined by observing the gamma radiation with a Ge(Li) detector. The experimental values obtained for (n,2n) and (n,p) reactions are compared with the predictions of recently developed empirical and semi-empirical equations, and the usefulness of these equations is discussed. Author (TAB)

N71-15334# California Univ., San Diego.
ISOTOPE-SHIFT OF NUCLEAR CHARGE DISTRIBUTIONS. 1. STATISTICAL THEORY OF DEFORMED NUCLEI,2. VALIDITY OF THE STRATINSKY SHELL CORRECTION THEORY, 3.
Wing-fai Lin (Ph.D. Thesis) 1970 90 p refs
(Contract AT(11-1)-GEN-10)
(UCSD-10-P-11-105) Avail: NTIS

The energy-density formalism is applied to the study of the isotope shift of nuclear charge distributions. It allows one to determine the part of the shift due to a statistical change in the proton densities. The study is improved by a shell-model calculation based on the Thomas–Fermi potential. The charge distributions are in relatively good agreement with experiment. However, the present model cannot reproduce the part of the shift due to nonmonotonic changes in charge distributions. These nonmonotonic effects are of a more complicated origin; they are of the same order of magnitude as the statistical shifts. In the case of the pair of (Ca-40)–(Ca-48) the results are consistent with shifts calculated in self-consistent (Hartree–Fock) methods. The changes in binding energy of Element X (Z = 114, A = 298) under deformation into prolate spheroidal shapes were calculated using the statistical theory of nuclei. Author (NSA)

N71-15335# Oak Ridge National Lab., Tenn.
NUCLEAR SHIELDING CALCULATIONS. NOTE NO. 6: ALTRAN CODE, CALCULATION OF NEUTRON TRANSMISSION AND REFLECTION IN SHIELDS BY THE MONTE CARLO METHOD
1965 42 p refs Transl. into ENGLISH from French Rept. Prepared by Sci. Transl. Serv., Ann Arbor, Mich. for ORNL
(ORNL-tr-2360) Avail: NTIS

A neutron scattering calculation by a Monte Carlo method is described. The object is to obtain an angular flux and dose distribution due to neutrons reflected and transmitted by a slab of a given material. Gamma radiation produced by inelastic doses or neutron radiation in the material are neglected. The method of calculation, the computer programs, and flow charts are described. NSA

N71-15346# California Inst. of Tech., Pasadena.
HADRODYNAMICS AND QUARK STRUCTURE
Stephen Ellis, Paul H. Frampton (Chicago Univ.), Peter G. O. Freund (Chicago Univ.), and David Gordon (Natl. Accelerator Lab.) Aug. 1970 51 p refs Sponsored in part by NSF
(Contract AT(11-1)-264)
(COO-264-558; EFI-70-49) Avail: NTIS

It is proved that conformal invariance of dual dynamics unambiguously fixes the possible quark configurations of all (exotic and nonexotic) hadrons. All these configurations follow a simple star of David rule. Rules for computing amplitudes for arbitrary hadronic processes involving external and/or intermediate exotic hadrons are given. The existence of quark diagrams such that one diagram has poles in all three channels of a four point function is pointed out. The total quark number of a hadron is identified with a Casimir operator of a new D-spin group. Author (NSA)

N71-15356# Kansas Univ., Lawrence.
INVESTIGATIONS OF NUCLEAR AND ELECTRONIC SPIN WAVES BY PARALLEL PUMPING
Larry W. Hinderks Jul. 1970 103 p refs
(Contract AT(11-1)-1488)
(COO-1488-20) Avail: NTIS

The concept of nuclear spinwaves is the result of attempts to explain seemingly anomalous nuclear magnetic resonance (NMR) data of Mn(++) in antiferromagnetic KMnF3. In a ferromagnet or antiferromagnet with a hyperfine interaction the MNR frequency which is measured is in disagreement with that predicted by the simple argument presented. Author (NSA)

N71-15357# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.
ISOTOPE SPLITTING OF THE F CENTER IN-GAP MODE IN KI AND KBr
D. Baeuerle and R. Huebner (Stuttgart Univ.) 5 Mar. 1970 44 p refs Sponsored by AEC
(NYO-2391-115; Rept-1331) Avail: NTIS

High resolution measurements at the F center in-gap mode in KI and KBr have revealed a threefold structure in the absorption spectrum with lines at 82.62 + or − 0.02, 81.98 + or − 0.02, 81.98 + or − 0.05/cm and at 99.60 + or − 0.03, 99.07 + or − 0.04, 98.50 + or − 0.05/cm respectively. This structure is interpreted as being due to the presence of two stable isotopes, K-39 and K-41, in the crystal. In a three dimensional model calculation which uses as parameters changes in the force constants between the defect and the 1st nearest neighbors (A01) and changes in the force constant between the 1st and the 4th nearest neighbors (A14), it was found that the in-gap mode frequencies are extremely sensitive to the value of the latter. Stress experiments on the strongest lines in KI are in agreement with the model. Extending the calculation to Cl(−) and Br(−) centers in KI, it is shown that the measured isotope splitting for Cl-35, Cl-37 and Br-79, Br-81 centers can be explained by taking into account not only changes in A01 but also changes in A14. Author (NSA)

N71-15358# Florida State Univ., Tallahassee. Dept. of Chemistry.
W-VALUES IN MIXTURES OF GASES CONTAINING AMMONIA
P. R. Green, L. M. Hunter, and R. H. Johnsen [1970] 31 p refs
(Contract AT(40-1)-2001)
(ORO-2001-14) Avail: NTIS

Further measurements of W-values (the energy to form an ion pair) in gaseous mixtures of ammonia were made to gain an understanding of the initial partitioning of energy between the mixture components and subsequent interactions. Author (NSA)

N71-15387# Air Force Systems Command, Wright-Patterson AFB, Ohio. Materials Lab.
A MOLECULAR ORBITAL INTERPRETATION OF THE SOFT X-RAY L(11111) EMISSION AND ABSORPTION SPECTRA FROM SOME TITANIUM AND VANADIUM COMPOUNDS Technical Report, Jun. 1969–Jan. 1970
David W. Fischer Aug. 1970 43 p refs
(AD-713100; AFML-TR-70-88) Avail: NTIS CSCL 7/4

A molecular-orbital energy-level diagram is constructed and used to interpret the metal-ion L(11,111) X-ray emission and absorption spectra from the oxides, nitrides, carbides, and borides of titanium and vanadium. It is shown that the MO model provides a more accurate description of the experimental results than did the ionic model and crossover transition theory. Specific electronic transitions are assigned to spectral components. Anomalous emission peaks which fall on the low energy side of the main L(111) band are found to originate in molecular orbitals which are primarily associated with ligand 2p and 2s levels. Author (TAB)

N71-15549# Utrecht State Univ. (Netherlands). Organic Chemistry Lab.

BARRIERS TO INTERNAL ROTATION FROM RELATIVE INTENSITIES OF MICROWAVE ABSORPTION LINES

Gerrit Ruitenberg (Ph.D. Thesis) Jul. 1970 98 p refs Partly in DUTCH and partly in ENGLISH Sponsored by Neth. Organ. for Pure Sci. Res.

Avail: NTIS

Two microwave spectroscopic methods can be used to determine the height of the potential barrier to internal rotation (torsional vibration). The relative intensity method (RIM), based on the measured intensity ratio of a given rotational transition in the ground and in an excited torsional state, was investigated in detail. A new variant is presented in which torsional energies are determined directly from the slope of the log (intensity ratio)/ reciprocal of temperature graph. ESRO

N71-15573# Oak Ridge National Lab., Tenn.

CHEMICAL APPLICATIONS OF NUCLEAR EXPLOSIONS (CANE) Progress Report, 1 Apr.–30 Jun. 1970

W. D. Arnold and D. J. Crouse, comps. 25 Aug. 1970 28 p refs Sponsored by AEC

(ORNL-TM-3116) Avail: NTIS

Projects described include studies of the behavior of radionuclides in the recovery of copper from nuclear broken are deposits; studies of the behavior of radionuclides in the recovery of oil from nuclear broken oil shale; analysis of gas samples from nuclear-stimulated natural gas wells; and studies of the behavior of radionuclides in storage reservoirs created with nuclear explosives. NSA

N71-15591# California Inst. of Tech., Pasadena. W. M. Keck Lab. of Engineering Materials.

THEORY OF s-d EXCHANGE SCATTERING IN DILUTE MAGNETIC ALLOYS: THREE-PARTICLE SOLUTION

Anupam Madhukar Oct. 1970 9 p refs

(Contract AT(04-3)-822)

(CALT-822-12) Avail: NTIS

The theory of s-d exchange scattering of conduction electrons off localized magnetic impurities is generalized to within the three particle intermediate states. Exact results for the t-matrix are given. Comments are made on the contribution of three particle intermediate states. Author

N71-15592# Lyon Univ. (France). Inst. de Physique Nucleaire.

SPURIOUS REACTIONS ENCOUNTERED IN THE DETERMINATION OF OXYGEN IN SILICON BY ALPHA PARTICLE ACTIVATION [REACTIONS PARASITES RENCONTREES LORS DU DOSAGE DE L'OXYGENE DANS LE SILICIUM AU MOYEN DE PARTICULES ALPHA]

J. Giroux, M. Talvat, J. P. Thomas, and J. Tousset 13 May 1970 13 p refs in FRENCH

(LYCEN-7038) Avail: AEC Depository Libraries

Reactions inducing F-18 activity in silicon and their influence on the determination of small quantities of oxygen in silicon by the reaction O yields F-18 were studied. When the irradiation was carried out with 54-MeV alpha particles, the profile of the F-18 production curve in the silicon indicated an activity that decreased very rapidly from the surface, until a depth of 500 micron was reached, without demonstrating any effect due to the activation curve. The diffusion of the F-18 nuclides created in the oxide layer at the surface could not explain this result. The difference between these curves was attributed to spurious reactions inducing F-18 activity in silicon. In order to confirm the existence of the Si yields F-18 reaction, the curve profiles of Na-24 and Al-29 produced by other spurious reactions in silicon were investigated. It was pointed out that the choice of incident energy was very critical. Author (NSA)

N71-15618# Los Alamos Scientific Lab., N.Mex.

ANGULAR ANISOTROPY AND STRUCTURE OF THE FISSION BARRIER

K. D. Androsenko et al Jul. 1970 15 p refs Transl. into ENGLISH of Inst. of Phys. and Energetics, Obninsk, USSR, Report FEI-185

(LA-4369-TR; FEI-185) Avail: NTIS

Measurements are reported of the angular distributions of fragments produced in the neutron-induced fission of Th-232, U-238, Np-237, Pu-238, Pu-240, Pu-242 and Am-241 target nuclei and photon-induced fission of Th-232, U-238, Pu-238, Pu-240 and Pu-242 target nuclei. The (n,f) reaction was investigated using electrostatic generators, while the photofission reaction was studied with the help of the 12-MeV microtron. Particular attention was paid to excitation energies near the threshold. The experimental data do not fit the traditional picture of fission probability, but can be satisfactorily explained in terms of double-humped barrier concepts. In discussing the results of the measurements, the authors touch on the quasi-stationary states of the nucleus in the second valley, the structure of barriers, even-odd differences in fission probability, and the question of the penetration probability at certain energies in the case of highly deformed nuclei. Author (NSA)

N71-15619# Kernforschungszentrum, Karlsruhe (West Germany). Zyklotron-Lab.

MEASUREMENT OF THE EXCITATION FUNCTION OF THE (d,x) REACTION ON Co-59

R. Bilabel Apr. 1970 15 p refs In GERMAN

(KFK-1171) Avail: AEC Depository Libraries

Excitation functions for the production of Ni-57, Co-60, Co-57, Co-56, Fe-59, Mn-54, and Cr-51 by irradiation of Co-59 with deuterons were measured, with single foils and a stacked-foil arrangement, in the energy range from 10 to 52 MeV. The beam current of the incident deuterons was determined with aluminum monitor foils using the (Al-27)(deuteron, proton alpha) Na-24 reaction. The error in the absolute cross section scale was estimated as 15%. Author (NSA)

N71-15630# Brookhaven National Lab., Upton, N.Y. Div. of Technical Information.

THEORY OF THE NUCLEAR SPIN-LATTICE RELAXATION IN SOLID ORTHO-HYDROGEN

K. Valyasek et al 1970 19 p refs Transl. into ENGLISH from Russian Report JINR-P4-4893 Sponsored by AEC

(BNL-tr-357; JINR-P4-4893) Avail: NTIS

Theoretical and experimental studies of processes in solid hydrogen as spin-lattice relaxation, nuclear magnetic resonance, and infrared absorption are proposed. The longitudinal relaxation of a nuclear spin subsystem due to the interaction with a libron subsystem is investigated. An approximation analogous to the spin wave theory of the Holstein–Primakoff method was used to investigate the libron subsystem. The experiment qualitatively confirmed the order of the relaxation time. The nuclear spin-lattice relaxation was investigated for temperatures higher than the phase transition temperature. Author

N71-15656# Purdue Univ., Lafayette, Ind. School of Materials Science and Metallurgical Engineering.

ATOMIC MOBILITIES AND VACANCY WIND EFFECTS IN MULTICOMPONENT ALLOYS

M. A. Dayananda 16 Jul. 1970 6 p refs

(Contract AT(11-1)-1436)

(COO-1436-27) Avail: NTIS

An alternative approach for the kinetic expressions for intrinsic fluxes for the diffusion by vacancy mechanism in a n-component alloy is presented based on marker motion studies in diffusion couples for the determination of atomic mobilities and vacancy wind terms of components in a multicomponent alloy. Starting with the

fact, that for a random alloy model the vacancy wind effect is directly proportional to the vacancy flux, and assuming local thermodynamic equilibrium, the thermodynamic coefficients of the general flux equation are determined. It is concluded that from a pair of multicomponent diffusion couples with marker planes of identical composition, all kinetic parameters, including atomic mobilities, the vacancy wind parameters, and thermodynamic coefficients can be calculated at the common marker composition. F.O.S.

N71-15657# Stanford Univ., Calif.
EXPERIMENTS ON GENERAL RELATIVITY AT LIQUID HELIUM TEMPERATURES AND IN ZERO MAGNETIC FIELDS Final Technical Report, Feb. 1964 – Nov. 1969
William M. Fairbank and William O. Hamilton Wright-Patterson AFB, Ohio ARL Jul. 1970 36 p
(Contract AF 33(615)-1204)
(AD-713633; ARL-70-0264) Avail: NTIS CSCL 20/10

Research has been performed on a free precession nuclear gyroscope. A description of the proposed gyroscope is given. The technical progress toward such a device is discussed. Author (TAB)

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N71-14503# Sandia Corp., Albuquerque, N.Mex. Instrument and Facility Development Div.
DEVELOPMENT OF XENON LAMP EXPLOSIVES INITIATOR
P. B. Higgins and C. H. Kinsey Jun. 1970 32 p refs
(SC-DR-70-306) Avail: NTIS

Development of a 3-microsecond rise time light source capable of initiating sprayed lead azide at distances up to 4 inches with maximum jitter of 1 microsecond is presented. Enhanced ultraviolet output from a 5-foot xenon-filled lamp is achieved by operation at 53 kilovolts. Reported di/dt limitations and resistivity versus current density measurements for xenon lamps are extended significantly by the use of a relatively low-inductance, high-voltage system. Author

N71-14507# California Univ., Berkeley. Electronics Research Lab.
PLASMA RESEARCH Quarterly Progress Report, 1 Jan. – 31 Mar. 1970
31 Mar. 1970 143 p refs
(Contract AT(04-3)-34)
(UCB-34-P-128-15; QPR-1) Avail: NTIS

Research progress on the following topics is discussed: ion heating from modulated electron beams and interactions with plasma, plasma density and energy in magnetic mirror compression experiment, breakdown of adiabatic invariance in plasma heated at electron cyclotron frequencies, difference schemes for simulation of magnetized plasma, dispersion relations for oblique wave propagation in inhomogeneous magnetized plasma, and stabilization of oscillations in rotating potassium plasma. NSA

N71-14509# Eidgenossische Technische Hochschule, Zurich (Switzerland).
HELICON RESONANCES IN LOW PRESSURE PLASMAS [HELIKONRESONANZEN IN NIEDERDRUCKPLASMEN]
Otto Sager (Ph.D. Thesis) 1970 118 p refs In GERMAN; ENGLISH summary
(Rept-4458) Avail: NTIS

A phenomenon in low pressure discharges which is similar to what is known in solid state plasmas as helicon-resonances is investigated. Theoretical considerations based on a two dimensional plasma sheath are extended by taking into account the influence of the electron temperature and the nonuniform density distribution. Experimental results obtained in rectangular and circular confinements of a high frequency discharge with applied external static cross-magnetic field agree with the improved theory. Measurements on surface ionized Cs-plasmas show that the resonance behavior is not significantly influenced by the plasma generation. The numerical results are compared with measurements especially in the case of applied constant current and constant voltage of the HF-generator. It can be shown that the discharge can obtain in a state of helicon resonances over a wide domain of the external static magnetic field. Author

N71-14581# California Inst. of Tech., Pasadena.
[PLASMA RESEARCH] Final Review Report, 1 Sep. 1963–1 Sep. 1969
Roy W. Gould, Amnon Yariv, and Robert S. Harp 31 Aug. 1970 37 p refs
(Contract Nonr-220(50))
(AD-713228) Avail: NTIS CSCL 20/9

Research under the Contract generally covered the following areas: Plasma wave resonances in spatially non-uniform plasmas; Cyclotron and upper hybrid echo phenomena in plasmas; Plasma wave echoes; Cyclotron harmonic waves in plasmas; Resonance cones in anisotropic plasmas; Recombination radiation from forward biased p-n junctions; Electro-optic effect; Infrared absorption in gallium arsenide; and Modes in optical resonators with gain. The report contains a summary of research. Author (TAB)

N71-15010# Atomic Energy Commission, Washington, D.C.
MAGNETOPLASMADYNAMIC (MPD) CONVERTERS [MAGNETOPLASMADYNAMISCHE (MPD) WANDLER]
W. Peschka et al Sep. 1970 72 p refs Transl. into ENGLISH from German report DLR-FB-69-85
(AEC-tr-7161; DLR-FB-69-85) Avail: NTIS

Theoretical and experimental results on closed-cycle inductive MPD systems are given. Mercury vapor and argon are used as working fluids. Radiofrequency discharges were used for plasma generation. Cryopumping systems are used in the experimental setup with considerable success. Some ideas on the further development of the experimental work are given. Author (NSA)

N71-15011# Los Alamos Scientific Lab., N.Mex.
[PLASMA IMAGES]
Marcel Haegi [1969] 19 p ref Transl. into ENGLISH from Italian report LGI-68/16 Sponsored by AEC
(LA-tr-69-26; LGI-68/16) Avail: NTIS

A study was made of a dense plasmoid undergoing intense z pinches. The correlations between the temporal evolution of the induced voltage, the soft and hard X radiation, neutrons, and the mean radius are described. Parameters of the plasmoid under different operating conditions are described. NSA

N71-15014# Atomic Energy Commission, Washington, D.C. Div. of Technical Information.
POSSIBLE MECHANISM OF PLASMA DIFFUSION IN STELLARATOR L-1
M. S. Berezhetskiy et al [1970] 6 p refs Transl. into ENGLISH of Akad. Nauk SSSR, Moscow, report Conf-690619-15 Presented at the 3rd Conf. on Controlled Fusion and Plasma Phys., Utrecht
(AEC-tr-7157; Conf-690619-15) Avail: NTIS

The abnormally high rate of plasma diffusion in closed systems in the L-1 stellarator was analyzed, and published data on the mechanism of plasma escape from traps are discussed. An attempt was made to correlate the experiments with diffusion theory, using calculations of equilibrium electric fields and plasma lifetime parameters close to experimental. Results showed that the theory predicted correctly the magnitude of equilibrium electric fields; however, there was a difference between the experimentally observed and calculated time of plasma confinement. Observations of L-1 plasma potential functions and the confinement time indicate that losses are primarily due to collisional diffusion. NSA

N71-15015# Cornell Univ., Ithaca, N.Y. Lab. of Plasma Studies.
PROPERTIES OF THE HIGH BETA PLASMA STATE Progress Report, 1 Aug. 1969 – 31 Jul. 1970
31 Jul. 1970 431 p refs
(Contract AT(30-1)-3782)
(NYO-3782-4) Avail: NTIS

Research progress is reported on the following topics: (1) collision-free shock formation in finite temperature plasmas, (2) weak turbulent shocks in magnetized plasmas, (3) anomalous resistivity of a turbulent plasma, (4) test waves in a turbulent plasma, (5) nonlinear explosive ion beam-plasma interaction, (6) relativistic motion of a single particle undergoing cyclotron resonance in a magnetic mirror trap, (7) stability of nonuniform plasmas, (8) toroidal equilibria of relativistic electron plasmas, (9) nonlinear stabilization of high frequency instabilities in magnetic fields, (10) nonlinear beam-plasma interaction and stochastic acceleration, (11) nonadiabatic treatment of finite temperature effects in a magnetosonic disturbance, (12) ion gyroradius effect in the solitary pulse, (13) nonlinear Landau damping and beat wave trapping, and (14) the role of counterstreaming instabilities in the earth bow shock. NSA

N71-15020# Atomic Energy Commission, Washington, D.C. Div. of Technical Information.
PLASMA HEATING WITH STRONG ELECTRON BEAMS IN A MIRROR-TYPE MAGNETIC TRAP
R. A. Demirkhanov et al Sep. 1970 31 p refs Transl. into ENGLISH of Gos. Kom. po Ispolz. At. Energii, Sukumi, report NP-18059
(AEC-tr-7160; NP-18059) Avail: NTIS

The effect of beam instability on the mechanism of plasma heating in a mirror-type magnetic trap was studied. The experiments were performed with plasma produced by the beam and with plasma injected into the trap from an external source. The dynamics of the instability development and plasma heating processes were analyzed in detail. Theoretical results and experimental data showed that the process of plasma heating under instability conditions was followed by an abnormally fast escape of charged particles from the trap. Author (NSA)

N71-15060# California Univ., Livermore. Lawrence Radiation Lab.
GENERATION OF COHERENT RADIATION IN THE VISIBLE RANGE WITHIN PLASMA-BEAM DISCHARGE
Yu. V. Tkach et al Jul. 1970 11 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), no. 14, Sep. 1970 p 1470 – 1475
(UCRL-Trans-10478) Avail: NTIS

An investigation was made of laser generation with wave length 4880 A on high temperature argon plasma. There are two regimes of generation depending on the argon pressure. The first regime is conditioned by the inversion by fast electrons and is described by sudden perturbations. The second regime is conditioned by the step population of the higher generating level when the slow electrons collide with argon ions. The length and the output power of laser impulse differ in both cases; in the first regime the generating time is 16 microseconds and the peak power is 100 W; in the second regime, 65 microseconds and 6 W, correspondingly. Author (NSA)

N71-15061# Oak Ridge National Lab., Tenn.
METHOD OF MEASURING THE POLOIDAL MAGNETIC FIELD IN DIFFUSE TOROIDAL PINCHES
M. Murakami and J. F. Clarke Aug. 1970 11 p refs Submitted for publication
(ORNL-TM-3128) Avail: NTIS

A method of using the Thomson scattering of a CO2 laser beam is proposed to measure the poloidal magnetic field produced by the plasma current in diffuse toroidal pinches of the Tokamak type. The method is based on resolving the relative shape of the cyclotron lines, whose broadening is introduced by misalignment due to the poloidal field with respect to the large toroidal magnetic field on which the scattering system is aligned. Author (NSA)

N71-15142# New York Univ., N.Y. Courant Inst. of Mathematical Sciences.
NOTES ON CHARGE-NEUTRAL SELF-CONSISTENT PLASMAS AND FIELDS
Cathleen S. Morawetz Jan. 1970 77 p refs
(Contract AT(30-1)-1480)
(NYO-1480-139; MF-60) Avail: NTIS

The Vlasov equations are reduced to a general form for solving initial-value problems. These equations are then studied from the point of view of type and of important scale lengths. It is noted that transverse flows depending on only one space variable depend on sectron wavelength, c/ omega sub pe, for small mass ratio but ion wavelength, c/omega sub pi, is the natural length for all other cases. Steady flows on a scale length ion wavelength are studied as asymptotic limits. Estimates show that the fields and currents cannot grow faster than electron wavelength A where A is Alfven speed, unless the electrons are hot. The time-dependent one-dimensional equations with transverse field are investigated by various methods. The asymptotic treatment of electrons is determined. Correctly posed problems for the initial-boundary value problems are discussed and also some limiting cases. This study is made in Lagrangian coordinates. The results of computations for weak Riemann problems where there is no breaking and rarefaction piston problem are presented, along with the methods involved and justifications for certain assumptions such as neglecting third moments. Author (NSA)

N71-15181# Tennessee Univ., Knoxville.
THEORETICAL STUDY ON NONLINEAR INSTABILITIES IN PLASMA
Junichiro Fukai (Ph.D. Thesis) Aug. 1970 77 p refs
(Contract AT(40-1)-2598)
(TID-25531) Avail: NTIS

Some nonlinear instabilities in plasma are investigated from a quantum mechanical point of view: (1) explosive plasma instabilities and (2) plasmons and the linear and nonlinear two-stream instabilities. In order to provide necessary tools to discuss these problems, the second quantization formalism of particles in a magnetic field and the interaction Hamiltonian between particles and waves are reviewed. NSA

N71-15182# Nagoya Univ. (Japan). Inst. of Plasma Physics.
CONSTRUCTION IN TRIAL OF THE DIGITAL CORRELATION MEASURING DEVICE WITH A BROAD FREQUENCY-REGION SWEEPING, AND MEASUREMENT OF ELECTRON-DENSITY CORRELATIONS IN A REVERSE-BRUSH-CATHODE PLASMA
Takeshige Tsukishima and Naofumi Iwama Mar. 1970 30 p refs In JAPANESE
(IPPJ-DT-16) Avail: AEC Depository Libraries

Some three years after the start of joint studies on correlation measurements in a plasma, a digital correlation measuring device, covering 1 to 15 MHz, of the frequency-sweeping type was completed. Subsequently, an intermediate amplifier was provided to cover 100 kHz to 1.5 MHz. A plasma source of the reverse-diffusion

type and a reverse-brush-cathode plasma were also prepared. At present classic diffusion coefficients are obtained from the measurement of density correlations in a reverse-brush-cathode plasma. The digital correlation measuring device consists of amplifying and data logger sections. The former section is divided into two systems depending on the frequency values. In this section, the two input signals are frequency-converted, and the outputs are fed to the data logger section. In the latter section, to measure the correlation between two signals from the amplifying section, A-D conversion, digital multiplication, sampling, etc., are performed. The output data are retained as digital quantities in a memory circuit, which then can be drawn out by connecting a tape perforator to it. NSA

N71-15183# Centre de Recherches en Physique des Plasmas, Lausanne (Switzerland).
EXPERIMENTAL INVESTIGATION OF THE 90 MW ROTATING MAGNETIC FIELD PINCH
A. Berney, A. Heym, F. Hofmann, and I. R. Jones Jun. 1970 46 p refs
(LRP-43/70) Avail: AEC Depository Libraries

The results and interpretation of measurements made on the 90-MW rotating magnetic field pinch are presented. Three standard filling pressures of 20, 60 and 180 mtorr He were chosen, and the following measurements were made: streak and framing photography, electron line density profiles, electron and ion temperatures, and detailed magnetic probe measurements. Author (NSA)

N71-15184# Institut fur Plasmaphysik, G.m.b.H., Garching (West Germany).
CHARACTERISTICS OF THE SYSTEM OF STATIONARY PLASMA MACROSCOPIC EQUATIONS
H. Tasso Jan. 1970 8 p refs
(IPP-6/84) Avail: AEC Depository Libraries

The character of the system of stationary macroscopic equations including resistivity and viscosity was studied. The system can be split into five first-order sybsystems and one single equation. The subsystems all have an elliptic character, and the single equation is responsible for the mixed character of the whole system. This mixed character could cause difficulties for the boundary-value problem of stationary equilibrium even in axisymmetry, for which an example is given. It seems plausible that more refined systems retain this mixed character. Author (NSA)

N71-15196# Atomic Energy Commission, Oak Ridge, Tenn. Div. of Technical Information.
CONTROLLED FUSION AND PLASMA RESEARCH: A LITERATURE SEARCH
Milton O. Whitson, comp. Aug. 1970 830 p refs
(TID-3557(1967-68-Suppl) Avail: NTIS HC$10.00/MF$0.65

This search includes 5148 references on various aspects of plasma physics and controlled thermonuclear research. Report number, author, corporate author, and subject indexes are included. Author (NSA)

N71-15219# Harvard Univ., Cambridge, Mass. Cruft Lab.
SCATTERING BY IMPERFECTLY CONDUCTING SPHERES
Ronald W. P. King and Charles W. Harrison, Jr. Aug. 1970 39 p refs
(Contract F19628-68-C-0030)
(AD-713678; AFCRL-70-0483; SR-9) Avail: NTIS CSCL 20/14

The theory of scattering by an imperfectly conducting, dielectric or plasma sphere is reviewed briefly. Numerical values of the back scattering and forward scattering cross sections of spheres are given over wide ranges of the radius, the conductivity, and the permittivity including both positive and negative values. The angle of the electric field in the forward and backward directions is also represented. Author (TAB)

N71-15224# Texas Univ., Austin. Plasma Research Lab.
QUASI-STATIC ION CYCLOTRON WAVE STUDIES Progress Report
Donald Gary Swanson 15 Aug. 1970 40 p refs
(Contract AT(40-1)-3871)
(ORO-3871-4) Avail: NTIS

Theoretical studies of quasi-static ion cyclotron waves are described. The effects of collisions were studied and found to have a rather strong effect on the propagation characteristics in a low-temperature plasma, and that while the basic wave phenomena is essentially density-independent, the collision terms must be considered. It was also found that with self-consistent solutions, electron Landau damping is small only over a narrow band near cutoff. Both effects are included analytically, with numerical solutions for the effects of electron Landau damping versus ion cyclotron damping. The potential use of such waves for plasma heating is discussed. NSA

N71-15225# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
ADIABATIC ELECTRON PLASMA AND ITS EQUATION OF STATE
G. Knorr and J. Nuehrenberg May 1970 21 p refs
(Contract AT(11-1)-2059)
(COO-2059-3) Avail: NTIS

For slow processes in a collisionless two-component plasma, which conserve the adiabatic invariant of the electrons, the equation of motion for electrons is derived. The conservation laws for the whole system are discussed in relation to the equation of state and a consistent distribution function for the electrons. Author (NSA)

N71-15320*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FULLY IONIZED QUASI-ONE DIMENSIONAL MAGNETIC NOZZLE FLOW
Donald L. Chubb [Jan. 1971] 14 p refs Presented at the 9th Aerospace Sci. Meeting, New York, 25–27 Jan. 1971; sponsored by AIAA
(NASA-TM-X-52925) Avail: NTIS CSCL 20I

To investigate magnetic nozzle processes, a theoretical quasi-one dimensional analysis was employed. Included in the analysis are the effects of unequal electron and ion temperatures and electron thermal conductivity. The acceleration of the plasma is controlled by an imposed magnetic nozzle. The parameters that control the flow are the nozzle shape, the ratio of kinetic pressure to magnetic pressure, and the ratio of the nozzle throat radius to the collisional mean free path. Results show that higher nozzle exit velocities than a corresponding adiabatic flow are achieved. Also, the plasma temperature remains higher throughout the nozzle than a corresponding adiabatic flow. Author

N71-15362# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
SELECTED PAPERS PRESENTED AT THE HIGH-PRESSURE ARC SYMPOSIUM Final Report
K. M. Hunter, II Aug. 1970 277 p refs Presented at 22d Ann. Amer. Phys. Soc. Conf. on Gaseous Electron., Gatlinburg, Tenn., 28–29 Oct. 1969; sponsored by Am. Phys. Soc.
(AD-713131; ARL-70-0135) Avail: NTIS CSCL 20/9

Contents: Spectral characteristics of arcs; Transport and thermodynamic properties; Arc characteristics; Arcs in flow and magnetic fields; Time varying arcs; and Electrode effects. TAB

N71-15383# Mathematical Applications Group, Inc., White Plains, N.Y.
PENETRATION OF PHOTONS THROUGH A HOT ELECTRON GAS Final Report
S. Hui, M. H. Kalos, H. Steinberg, and E. Troubetzkoy Jun. 1970 64 p refs
(Contract DASA01-69-C-0150)

(AD-713485; MR-7006; DASA-2556) Avail: NTIS CSCL 20/9

The work reported here is the first phase of the study of improved techniques for determining the time-dependent history of a radiation field. A standard problem of the penetration of a Planck spectrum of photons through a hot electron gas is solved by the Monte Carlo technique. A code to calculate the energy and angular spectrum of transmitted radiation was written in which no attempt was made to include stimulated scattering or any other non-linear effects. Such non-linear effects will be included in the second phase of this study and the calculations here will be repeated. Results for several spectra at different temperatures and a medium of an electron gas of temperature between 0-20 Kev are given. Author (TAB)

N71-15373# Wisconsin Univ., Madison. Mathematics Research Center.

ASYMPTOTIC THEORY OF NONLINEAR WAVE MOTIONS IN MAGNETOHYDRODYNAMICS. PART 1: SURFACE WAVES

M. C. Shen Jan. 1970 36 p refs

(Contract DA-31-124-ARO(D)-462)

(AD-713439; MRC-TSR-1041-Pt-1) Avail: NTIS CSCL 20/9

A tractable asymptotic theory is developed for the study of nonlinear wave motions of a conducting fluid in a variable magnetic field subject to the constraints of some fixed bounding surfaces. Author (TAB)

N71-15374# Army Missile Command, Redstone Arsenal, Ala.

ON THE PROPAGATION OF HIGH INTENSITY, RELATIVISTIC ELECTRON BEAMS

Thomas G. Roberts 1970 13 p refs

(AD-713576) Avail: NTIS CSCL 20/9

Intense beams of relativistic electrons have been extracted from the electrode space of flash X-ray machines and projected into plasma columns and drift spaces. In the plasma columns the beam pinches itself and propagates to a target at the end of the discharge. The plasma column is produced by a conventional pinch discharge in argon and the magnetic field of the plasma column is sufficient to guide the high energy beam around rather sharp curves with little loss of energy. In addition to the very interesting properties of the beam itself, and its applications in thermonuclear work, the possibility of using these beams for a relatively inexpensive, ion accelerator which may produce intense pulses of heavy ions with energies as high as 10 to the 12th power eV per nucleon has recently stimulated research. It is the purpose of the paper to describe the principal experimental results so far obtained, and to derive an expression for the maximum current which a beam may possess by use of the Bennett theory and the equilibrium current distribution which the beam must assume. It will also be shown that this expression reduces to the Alfven limit in a frame in which the beams space charge is fully neutralized, and indicates that beams which exceed the Alfven limit may be expected to propagate in the laboratory frame. Author (TAB)

N71-15388# ARO, Inc., Arnold Air Force Station, Tenn.

SOLENOIDS EXCITED AT RADIO-FREQUENCIES IN THE PRESENCE OF PLASMAS Final Report, Sep. 1967 - Dec. 1969

J. A. Sprouse AEDC Oct. 1970 33 p refs

(F40600-71-C-0002)

(AD-713104; AEDC-TR-70-208) Avail: NTIS CSCL 20/9

The rf-excited coil in the presence of a plasma is examined in terms of a transformer model and also in terms of the distortion of the electromagnetic fields which is produced by the induced eddy-currents in the plasma. The treatment of rf coils presented here can be applied to either the plasma diagnostics regime or to the generation of the rf electrodeless discharge. Although the calculations of the electric and magnetic fields in this report are for a cylindrically symmetric coil immersed in a uniform, linear plasma, neither the model nor the approach to the problem is limited to these cases. Author (TAB)

N71-15562* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

CROSSED-FIELD MHD PLASMA GENERATOR/ACCELERATOR Patent

Alexander P. Sabol, inventor (to NASA) Issued 20 Oct. 1970 (Filed 24 Jan. 1969) 7 p Cl. 315-111; Int. Cl. H01j1/50; Int. Cl. H05j1/00

(NASA-Case-XLA-03374; US-Patent-3,535,586; US-Patent-Appl-SN-793770) Avail: US Patent Office CSCL 20I

A plasma generator and accelerator is described in which electrode pairs are mounted in a closed channel and a constant magnetic field is applied across the channel. The sides of the rectangular shaped channel parallel to the electrode pairs forms an idler (electrically floating) electrode. A working gas is introduced at one end of the channel. In operation, a main arc, supplied by a continuous power source, is created across the electrode pairs adjacent to the point of gas introduction. As it is being acted on by MHD forces, the main arc moves to the next electrode pair, and so on downstream. Each time a main arc moves to the next electrodes, side arcs are formed between each of the two electrodes of the prior electrode pair and the idler electrode. The side arcs move upstream in the outer sections of the channel and reconnect the electrode pair to form more main arcs. The reconnected main arcs then move downstream because of being acted on by MHD forces. Due to an electrical shorting action, the main arcs extinguish at the last electrode pair. The action of the main arcs accelerates plasma which is omitted from the channel.

Official Gazette of the U.S. Patent Office

N71-15650* Space Technology Labs., Inc., Redondo Beach, Calif.

METHOD AND APPARATUS FOR MEASURING POTENTIALS IN PLASMAS Patent

Robert F. Kemp, John M. Sellen, Jr., and Jack C. Slattery, inventors (to NASA) Issued 24 Jan. 1967 (Filed 5 Oct. 1962) 6 p Cl. 324-72 Sponsored by NASA

(NASA-Case-XLE-00821; US-Patent-3,300,717; US-Patent-Appl-SN-228707) Avail: US Patent Office CSCL 20I

The apparatus and methodology described is not limited to measuring potential variations in plasmas, but may be used for measuring such variations in any body of dilute gas or near vacuum through which an electronic beam can be projected. The proposed apparatus has particular application in electrostatic propulsion space vehicles, especially in the case where an ion engine operates in a pulsatory mode and it is necessary to detect and measure the character and amplitude of transient variations in the plasma potential. It is stated that the apparatus and related methods overcome the basic difficulty of measuring without perturbing the ion beam and enable detection and measurement of intraplasma transients having durations of less than one microsecond. D.L.G.

N71-15665# Nagoya Univ. (Japan). Inst. of Plasma Physics.

FEEDBACK CONTROL OF THE PIG DISCHARGE OF THE QP MACHINE

Kiyokata Matsuura, Genichi Horikoshi, Tsutomu Kuroda, and Teruyuki Sato Nov. 1970 35 p refs

(IPPJ-T-2) Avail: NTIS

The technical problems involved with an electronic circuit of a feedback control system for high current PIG discharge are treated. In the PIG discharge with an electron bombarded hot cathode, the discharge current is kept constant by controlling the cathode temperature by means of the bombardment power control. A circuit with an available open loop gain of 100 is designed to

control the discharge current. The characteristics of the control system is examined and experimental results for the response time and the time constant of every part in the system are summarized for discharge parameters. A simple analysis for the stability of the system is made by considering the time constant of elementary circuits and the open loop gain of the system. The observed stability of the system is quite satisfactory with a small drift less than 0.006/hour. The adjustment of discharge voltage or current can easily be made by a selector switch with a great convenience in practical operation. Some physical problems of hot cathode discharge are also discussed. Author

N71-15666 California Univ., San Diego.
SOME PROBLEMS OF GEOPHYSICAL INTEREST IN THE THEORY OF COLLISIONLESS PLASMAS
Joseph Ruce Kan (Ph.D. Thesis) 1969 105 p
Avail: Univ. Microfilms: HC $5.20/Microfilm $3.00 Order No. 70-4283

Two problems of geophysical interest are considered. First, the noise spectrum received by an antenna in a plasma is calculated. Such a spectrum is directly related to electric field measurements in space. The second problem concerns generation mechanisms of geomagnetic micropulsations, which leads to the study of instabilities of Alfven waves. General expressions for the noise spectrum received by an antenna in an isotropic plasma and an anisotropic beam-plasma system are derived, using a combination of plasma fluctuation theory and the reciprocity theorem. The special case of Maxwellian velocity distributions for the constituents is then considered. In the more special case of thermal equilibrium, Nyquist's theorem is shown to be satisfied. It is shown that a Maxwellian energetic electron constituent, carrying only a small fraction of the total thermal energy, can considerably enhance the spectral density of the antenna noise just above the plasma frequency. The maximum enhancement factor is equal to the square of the ratio of the thermal velocities of the high and low energy electrons. Dissert. Abstr.

N71-15667# Nagoya Univ. (Japan). Inst. of Plasma Physics.
EXPERIMENTS OF PLASMA CONFINEMENT IN JIPP STELLARATOR-1: PRELIMINARY RESULTS USING J x B GUN AND ECRH PLASMA
Kenro Miyamoto, Akihiro Mohri, Nobuyuki Inoue, Masami Fujiwara, and Kiyoshi Yatsu (Tokyo Univ. of Educ.) Nov. 1970 34 p refs
(IPPJ-102) Avail: NTIS

To investigate the dependence of plasma confinement on the properties of the magnetic field (rotational transform angle, shear, magnetic well, plasma radius etc.), a circular stellarator with a vertical field was constructed. Several kinds of plasma sources (J x B type gun with a fast acting valve, titanium gun, ECRH, r.f. stochastic heating, and ohmic heating by air coil) were prepared. Preliminary results of the experiments on the plasma confinement using J x B type gun and ECRH plasma are described. The diffusion coefficient estimated from the decays times and the plasma radius are inversely proportional to the square of the rotational transform angle. The confinement time does not depend appreciably on the property of the magnetic well (and antiwell). The dependence of the confinement time on the magnitude of the magnetic field is appearently linear. Author

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N71-14517# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Physics.
SPIN INTERACTIONS IN Cu(NO3)2.2.5H2O
J. C. Bonner, S. A. Friedberg, H. Kobayashi, and B. E. Myers 1 Sep. 1970 12 p refs Submitted for publication Sponsored in part by NSF
(Contract N00014-67-A-0314-0006)
(AD-713133; TR-2) Avail: NTIS CSCL 20/12

Cu(++) spins in Cu(NO3)2.2.5H2O are antiferromagnetically coupled in pairs which experience a weaker antiferromagnetic interpair interaction. The linked pairs appear to form one-dimensional arrays. The magnetic and thermal data are quantitatively described by two models in which pairs form (1) rungs of a ladder; (2) alternate links of a chain. Unusual behavior upon adiabatic magnetization at very low T is also interpretable with these models. Author (TAB)

N71-14562# Picatinny Arsenal, Dover, N.J. Feltman Research Labs.
STRUCTURE AND LATTICE DYNAMICS OF METAL AZIDES AND THEIR RELATIONSHIP TO STABILITY
Samuel F. Trevino, Chang S. Choi, Zafar Iqbal, Richard D. Mical, and Henry J. Prask 1970 15 p refs
(AD-713585) Avail: NTIS CSCL 20/2

Earlier research attempted to relate the low frequency molecular motions in solid explosives to the ease of initiation of detonation. However, in order to obtain a detailed and quantitative physical picture it was necessary to have more complete information on the crystal structures of the explosives, and to develop and apply improved techniques to resolve the spectra of molecular motions in crystals. The paper, dealing with the structure and lattice or molecular dynamics of inorganic azides at room temperature, presents one facet of the program which has yielded significant advances in technique and in our understanding of explosives stability. Author (TAB)

N71-14565# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
DIAMAGNETISM DUE TO FLUCTUATIONS IN SUPERCONDUCTORS
Jerry P. Gollub Sep. 1970 191 p refs
(Contracts N00014-67-A-0298-0022; N00014-67-A-0298-0006; ARPA SD-88; Grant NSF GP-11392)
(AD-713242; TR-3) Avail: NTIS CSCL 20/3

Fluctuations of the order parameter above T sub c in superconductors give rise to a small diamagnetism, comparable in magnitude to the Landau diamagnetism. An extremely sensitive magnetometer system was devised to measure this small temperature-dependent diamagnetism. A superconducting quantum interference device coupled to the sample was used as a magnetic flux detector. The sample temperature could be varied continuously between 2 K and 16 K while magnetization changes as small as 10 to the - 8th power gauss were resolved. Extensive measurements have been performed on bulk single crystals of three materials: indium, lead, and type II lead-thallium alloys. Each of these materials shows a temperature-dependent diamagnetism which is qualitatively described by Pranges calculation for small applied fields Results are discussed. TAB

N71-14582# Eidgenossische Technische Hochschule, Zurich (Switzerland).
SOME ELECTROCHEMICAL ASPECTS IN CRYSTALLIZATION FROM SOLUTIONS
Christos Natsis (Ph.D. Thesis) 1970 168 p refs
(Rept-4164) Avail: NTIS

The thermodynamic significance of the interface potential increase, generated during crystal growth from solution, was shown

in two different ways. First, an equation was derived showing that the composition at the crystal-solution interface is a function of the interfacial free energy, or the equivalent of it, the crystal-solution interfacial tension. Second, another equation was derived, showing that the above interfacial tension is a function of the electrical potential difference between crystal and solution. Experimental methods and results are presented which show that it is possible to measure in a relative way the interface electrical potential and the electrical charge density at the crystal-solution interface. A model for the crystallization process is proposed and an equation is derived showing the functional relationship between crystal growth rate and crystallization potential. Author

N71-14583# Technische Hogeschool, Eindhoven (Netherlands).
THERMOMAGNETIC EFFECTS IN CADMIUM ARSENIDE
Frasiscus Antonius Petrus Blom (Ph.D. Thesis) 11 Dec. 1970 103 p refs
Avail: NTIS

Measurements of the thermomagnetic transport phenomena in the semiconducting compound Cd3As2 are described. Experimental results include the following: The saturation values of the Seebeck coefficients are determined from coefficient changes in a magnetic field, and the electron effective masses are calculated. The scattering parameter is determined from the ratio between the saturation and zero-field values of the Seebeck coefficient. This analysis leads to the conclusion that within the investigated range of electron concentrations the scattering is caused by interactions with optical lattice vibrations. Data show that the transport effects at room temperature can be described by the band model and scattering mechanism. The electronic and lattice parts of the total thermal conductivity can be separated by measuring the change of the thermal conductivity in a magnetic field. Experimental Lorenz numbers in some samples are smaller than theoretical ones, indicating a partially inelastic scattering of electrons. This is confirmed by the fact that the thermal mobilities are smaller than the Hall mobility. Author

N71-14628# Research Inst. of National Defence, Sundbyberg (Sweden).
EXPERIMENTS TO IDENTIFY A STRONG DOUBLE REFRACTING MINERAL IN A POWDER MIXTURE WITH THE HELP OF A PHASE CONTRAST MICROSCOPE [FOERSOEK ATT IDENTIFIERA ETT STARKT DUBBELBRYTANDE MINERAL I EN PULVERBLANDNING MED HJAELP AV FASKONTRASTMIKROSKOP]
Bo Holmberg Aug. 1969 14 p refs In SWEDISH
(FOA-1-C-1320-40(43)) Avail: NTIS

A short survey of the theory of phase contrast microscopy and the literature available for further studies is given. Experiments were carried out to establish whether a certain strong double refracting mineral could be identified in a powder mixture, with sufficient contrast for showing up grain size distribution in a mineral by means of television microscope QTM. The result shows that QTM with phase contrast is not suitable for use in cases where the powder mixture consists of several strong double refracting components. Author

N71-14639# Energy Conversion Devices, Inc., Troy, Mich.
TEMPERATURE AND PRESSURE DEPENDENCE OF THE OPTICAL AND ELECTRICAL GAP IN CHALCOGENIDE GLASSES
Edward A. Fagen, H. Fritzsche (Chicago Univ.), S. H. Holmberg, R. W. Seguin, and J. C. Thompson 1970 16 p refs Presented at Tenth Intern. Conf. on the Phys. of Semicond., Cambridge, Mass., 17–21 Aug. 1970
(Contract DAHC 15-70-C-0187; ARPA-Order-1570)
(AD-713288) Avail: NTIS CSCL 20/12

The optical absorption edge E sub g and the conductivity sigma of two bulk chalcogenide semiconductor glasses were measured as functions of pressure and temperature. Results are discussed. TAB

N71-14640*# Ohio State Univ., Columbus. ElectroScience Lab.
ELECTRON BEAM PUMPED LASER ACTION IN SELENIUM AND TELLURIUM WITH APPLICATIONS FOR TUNABLE BACKWARD PARAMETRIC OSCILLATIONS Final Report
Sep. 1970 67 p refs
(Grant NGR-36-008-103)
(NASA-CR-111825; FR-2879-4) Avail: NTIS CSCL 20L

Research is reported aimed at the growth and characterization of Se and Se(x)Te(1-x) alloy crystals for use in devices requiring certain optical characteristics. A modified Bridgman technique was used to produce crystals of various alloy compositions Se(x)Te(1-x) but the quality of these crystals was not remarkable. However, a pure Se crystal with an optical absorption constant alpha is less than 2/cm was grown. To identify some of the crystal defects which might be responsible for the residual optical absorption, various photoelectronic effects were investigated. Photoconductivity data showed the existence of a defect level below the band edge which varied smoothly with alloy composition. Width of the photoconductivity spectral response was larger in the alloy crystals than in the pure Se crystals, indicating the poorer quality of these crystals. Thermally stimulated current measurements showed a plethora of deep defect levels, especially in the alloy crystals. Author

N71-14704*# Cincinnati Univ., Ohio.
ISOTOPE EFFECTS IN THE SPECIFIC HEAT OF SOLID NEON
Eugene Somoza and Henry Fenichel [1970] 50 p refs
(Grant NGR-36-004-014)
(NASA-CR-115877) Avail: NTIS CSCL 20L

Specific heat measurements of Ne-20 and Ne-22 are reported in the temperature range of 2.5–23.5 K. The measurements were made simultaneously on the two isotopes in a calorimeter employing a mechanical heat switch. The results are presented in the form of tables of smoothed values of thermodynamic properties including specific heat at constant pressure, specific heat at constant volume, entropy, enthalpy, and the Gruneisen parameter. The results are compared with the Nernst – Lindemann equation, Gruneisen equation of state, and the theoretical calculations of others. Excellent agreement is found at low temperatures between the present results and calculations based on anharmonic models. However, discrepancies arise at higher temperatures. Author

N71-14774# National Science Foundation, Washington, D.C.
ELECTRICAL CONDUCTIVITY AND SELF-DIFFUSION COEFFICIENTS OF CATIONS IN SILVER IODIDE [OB ELEKTROPROVODNOSTI KOEFFITSIENTAKH SAMODIFFUZII KATIONOV V IODIDE SEREBRA]
V. I. Baranovskii et al 1970 8 p refs Transl. into ENGLISH from Akad. Nauk SSSR, Dokl. (USSR), v. 105, no. 6, 1955 p 1188–1191
(TT-70-57019) Avail: NTIS CSCL 20L

A study was carried out on the electrical conductivity of cylindrical samples pressed from spectrally pure AgI under a pressure of 3000 to 4000 kg/sq cm. It showed that the plastic deformation caused by pressing leads to a sharp rise of the electrical conductivity. USGRDR

N71-15000# Cornell Univ., Ithaca, N.Y. Materials Science Center.
LUMINESCENCE STUDY OF EXCITON-EXCITON INTERACTION IN CADMIUM SULFIDE, CADMIUM

SELENIDE, AND ZINC OXIDE
Michael Douglas Magde (Ph.D. Thesis) Jun. 1970 139 p refs
(Contract Nonr-401(47))
(AD-713181; MSC-1325; MSC-TR-32) Avail: NTIS CSCL 20/12

The thesis reports the results of an experimental study of luminescence in several 2-6 semiconducting compounds at excitation levels, provided by laser pulses, of 1 Kw/sq cm to 5 Mw/sq cm. Under such conditions an additional luminescence band appears which is not obeserved when luminescence is excited by much lower intensity conventional mercury lamps. The additional emission was observed in two different types of CdS as well as in CdSe and ZnO. In each case it increased at a rate faster than linear, becoming prominent in the range 10 - 100 kW/sq cm whereas luminescence attributed to bound excitons increased linearly with excitation intensity at first, but eventually, in all cases except ZnO, appeared to saturate. A kinetic treatment of the model yields the following value for the cross section for this process: 10 to the 16th power/sq cm. Author (TAB)

N71-15017# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
EFFECTS OF GAMMA RADIATION ON THE PIEZOELECTRIC PROPERTIES OF LITHIUM NIOBATE
R. W. Smith Jul. 1970 14 p refs
(Contract AT(45-1)-1830)
(BNWL-1436) Avail: NTIS

Lithium niobate can be used to significantly extend the operating temperatures of ultrasonic transducers. Since some high-temperature transducer applications involve exposure to nuclear radiation, it is important to determine the effect of this radiation on the piezoelectric properties of the transducer crystal. The effect of gamma radiation on the piezoelectric properties of lithium niobate crystals was measured. X-cut and z-cut lithium niobate transducer plates were exposed to gamma radiation from a Co-60 source. The electromechanical coupling factor, the dielectric constant and the frequency constant were measured before exposure and at periodic intervals up to 10 to the 10th power R total dose. No significant change was detected in any of these parameters. This indicates that lithium niobate is well suited for applications involving exposure to high levels of gamma radiation. Author (NSA)

N71-15177# Grumman Aerospace Corp., Bethpage, N.Y. Space Sciences Section.
ON A MICROWAVE GAIN MECHANISM IN HIGH MOBILITY SEMICONDUCTORS
M. R. Wohlers Dec. 1970 31 p refs
(RM-491) Avail: NTIS

A theory is proposed for the microwave gain mechanism that is observed in large samples of high mobility semiconductors, such as InSb, when they are excited with a static electric field and a transverse static magnetic field. The theory is based on a plasma model of the conduction process that considers only diffusion and Lorentz forces. It is shown that a resonant condition can be achieved, in samples of finite size, when the ratio of the transverse to longitudinal electric field components of the hybrid plasma wave in such materials is properly adjusted. The discussion presents certain evidence that supports the basic premise of the study, namely, that this ratio can be adjusted by varying the applied static electric field. Microwave equivalent network representation, which was derived, can be utilized in further experimental studies of the phenomenon as well as in the development of electronic devices. Author

N71-15297# Yeshiva Univ., New York. Belfer Graduate School of Science.
PHASE CONNECTIVITY IN DIFFUSION LIMITED SEPARATIONS Final Report
Martin Goldstein 20 Jul. 1970 48 p refs
(Contract AT(30-1)-3678)
(NYO-3678-3) Avail: NTIS

Additional details to the published paper Interparticle Interference Effects in Diffusion-Controlled Growth are presented. The diffusion flux is calculated from the solution to the Laplace steady-state diffusion equation when the problem considered is equivalent to that of the potential field of two conducting spheres with the spheres at the same potential. Aspects of surface tension, considerations of mass conservation, and applications to problems of stability are discussed with a treatment of two-interacting particles. F.O.S.

N71-15298# Centre National de la Recherche Scientifique, Paris (France).
FAR INFRARED SPECTRA OF CRYSTALS AND SOLIDS IN A LARGE RANGE OF TEMPERATURES Final Scientific Report, 1 May 1966 - 31 Jan. 1970
Joan Lecomte and Armand Hadni 28 Feb. 1970 17 p refs
(Contract AF 61(052)-957)
(AD-713677; AFCRL-70-0426) Avail: NTIS CSCL 7/4

Far infrared spectra of crystals and solids in a large range of temperatures have been studied from 20 to 700 micrometers: pure single crystals mainly of high symmetry (potassium bromide, potassium iodide, thallium halides, cesium halides, silver halides; magnesium oxide, iron oxide, manganese oxide; zinc selenide, zinc telluride, cadmium selenide, copper chloride, quartz and potassium bichromate; silicium dioxide polymorphs, binary glasses); doped single crystals (KBr:Cl, KBr:Na, KI:Na, KI:Cl, KC1:Na, KCl:I, NaI:Cl); molecular crystals either inorganic or organic; hydrogen bonded crystals; rare earth and transition metals salts; clathrates of hydroquinone with HC; and H2S. Author (TAB)

N71-15299# Idaho Nuclear Corp., Idaho Falls.
THE USE OF VALENCE FORCE POTENTIALS IN CALCULATING CRYSTAL VIBRATIONS. 2: DIPOLE COORDINATE APPROXIMATION FOR LONG AND INTERMEDIATE RANGE FORCES
A. W. Solbrig, Jr. Jul. 1970 49 p refs
(Contract AT(10-1)-1230)
(IN-1409) Avail: NTIS

The motions of atoms in crystalline solids were studied in models of interpolation schemes. The basic ideas of the valence force model for crystals are discussed in terms of two-dimensional crystal lattices with translation vectors. The physical content of the dipole coordinate approximation, and the equations for the potential energy functions in the dipole coordinate model are analyzed. F.O.S.

N71-15345# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.
STRUCTURE, PROPERTIES AND RADIATION SENSITIVITY OF ELECTRICALLY BISTABLE MATERIALS Semiannual Report
Derek B. Dove, Larry L. Hench, and Robert W. Gould 6 Aug. 1970 22 p refs
(Contract DAHC04-70-C-0024; ARPA Order 1562)
(AD-713483; SAR-1) Avail: NTIS CSCL 20/12

The report describes work carried out during the first six-month period on a project directed towards a thorough electrical and metallurgical characterization of selected amorphous semiconducting materials. Equipment for bulk glass preparation has been set up and some thin film structures have been fabricated by flash evaporation techniques. Work has commenced on local order structural measurements and electrical characterization of binary germanium tellurium alloys. It is intended that this study will be extended into more complicated systems as the project continues. Work has commenced on systems based on the vanadium,

phosphorus and potassium oxides, and a new crystalline phase has been discovered within this system. A comparative study of the electronic properties of crystalline materials and glasses having the same composition is being carried out. Finally, degradation of thin film electrodes has been observed under certain conditions and is being investigated. Author (TAB)

N71-15348# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.

EVIDENCE FOR A CENTRAL INSTABILITY IN KBr:Li(+)

R. D. Kirby and A. J. Sievers Aug. 1970 11 p refs
(Contract AT(30-1)-2391)
(NYO-2391-118; Rept-1440) Avail: NTIS

The observed frequency shifts of the lattice resonant mode in KBr:Li(+) are not consistent with a model potential which includes quartic anharmonic terms, but these results can be explained by a potential with a central barrier with the barrier height less than the zero point energy of the oscillator. Author

N71-15360# Ballistic Research Labs., Aberdeen Proving Ground, Md.

THE SHOCK HUGONIOT OF SINGLE-CRYSTAL SODIUM CHLORIDE

George E. Hauver and Angelo Melani Aug. 1970 19 p refs
(AD-713599; BRL-MR-2061) Avail: NTIS CSCL 20/12

Shock Hugoniot data for single-crystal sodium chloride have been obtained within the pressure range from 90 to 700 kbar. The data in the shock velocity - particle velocity plane do not clearly define the onset of the transition from face-centered-cubic (NaCl) to body-centered (CsCl structure, but show evidence of it by a displacement which is first detected between 260 and 280 kbar for the (100) orientation and between 220 and 230 kbar for the (111) orientation. Lateral relaxation measurements on (111) specimens provide evidence of the transition at 208 kbar. After the displacement which occurs near the onset of the transition, data in the shock velocity - particle velocity plane follow a linear relation up to 460 kbar, where the Hugoniot stiffens to enter a third region which extends linearly up to 700 kbar (and probably to higher pressures). It is tentatively suggested that the third region from 460 to 700 kbar represents the body-centered structure, and that the second region may be a manifestation of the experimental techniques. The data are compared with those of other investigators. Author (TAB)

N71-15375# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

STUDY IN LINE AND SHAPE: CYCLOTRON RESONANCE IN InSb USING AN INFRARED LASER

J. R. Apel and T. O. Poehler Sep. 1970 138 p refs
(Contracts N00017-62-C-0604; NOw-62-0604-c)
(AD-713094; APL-TG-1111) Avail: NTIS CSCL 20/12

An experimental and theoretical study of the shape of electron cyclotron resonance lines in n-type InSb has been made, using a far infrared gas laser as a signal source, and the quantum plasma dielectric tensor as the mathematical model describing the resonant process. The laser wavelengths ranged from 337 to 48 micrometers; the sample temperature was either 4.2 or 77 K. At liquid He temperature, an anomalous narrowing of the resonance lines is observed as the resonant magnetic field is increased, which the theory ascribes to the decreasing efficacy of ionized impurity scattering in causing Landau level transitions at high magnetic fields. Strong electron and photon interactions with the optical phonon modes are observed via greatly rebroadened lines as the magnetic field approaches 30 kG. Impurity resonant transitions are also observed having harmonics up to the fifth. At 77 K the cyclotron resonance has nearly the width expected if phonon scattering alone were at work. Author (TAB)

N71-15376# Florida Univ., Gainesville. Dept. of Engineering Science and Mechanics.

ON THE DESCRIPTION OF CRYSTAL DEFECTS BY POINT FORCE ARRAYS

Craig S. Hartley 9 Oct. 1970 30 p refs
(Contract N00014-68-A-0173-0002)
(AD-713214; TR-4) Avail: NTIS CSCL 20/2

A modification to the continuum theory of crystal defects is described in which the interatomic reaction forces developed when a defect is introduced are replaced by point forces in a continuum. The location of the forces is determined by the atomic positions surrounding the defect, and the magnitudes by the requirement that the force array produce the proper displacement field for the defect. The technique is applied to the construction of primitive prismatic and shear dislocation loops and a vacancy in a hypothetical isotropic, simple cubic lattice. A screw dislocation is formed from an array of shear loops and the displacement field, width and self-energy is calculated. The construction employed eliminates the singular behavior of the self-energy at the dislocation core and results in a wider dislocation than the Peierls model. Applications of the model to other dislocation configurations are suggested. Author (TAB)

N71-15389# Army Electronics Command, Fort Monmouth, N.J. Inst. for Exploratory Research.

DIRECT SOLUTION OF COMPLEX CRYSTAL STRUCTURES BY ELECTRON MICROSCOPY

Jack A. Kohn, Charles F. Cook, Jr., and Donald W. Eckart 1970 14 p refs
(AD-713554) Avail: NTIS CSCL 20/2

Hexagonal ferrites, complex ferrimagnetic oxides having exploitable microwave/millimeter-wave properties, form structures too large and complex for solution by classical diffraction techniques. Determination of crystal structures, however, is essential for a structural understanding of properties and for attaining the ultimate objective of tailor-made materials in this frequency range. The procedure described herein uses high-resolution replica electron microscopy to read out structural stacking sequences encoded onto hexagonal ferrite crystal surfaces by hydrochloric and, particularly, nitric acid etching. The method readily permits the direct solution of such crystal structures, including materials with larger unit cells than in any known inorganic substances. Author (TAB)

N71-15442# Iowa State Univ. of Science and Technology, Ames.

EXCITON OSCILLATOR STRENGTHS IN SILVER CHLORIDE

Gordon Dennis Lassahn (Ph.D. Thesis) Aug. 1970 86 p refs
(Contract W-7405-eng-82)
(IS-T-374) Avail: NTIS

The oscillator strength of the first direct exciton in silver chloride was studied. Calculation of the oscillator strength from the energies of the transverse and longitudinal modes gave a much lower result, 0.027 per molecule, than did calculation of the oscillator strength from the area under the absorption constant curve, which gave a value of 0.24 per molecule. The value of 0.24 is considered reasonably accurate, and it is concluded that the method of calculating oscillator strengths from the energies of the transverse and longitudinal modes needs further study. Author

N71-15445# Cornell Univ., Ithaca, N.Y.

FAR INFRARED STUDIES OF THE PAIR MODE IN MnF2:Fe(2+)

K. Johnson and R. Weber Sep. 1970 12 p refs
(Contract AT(30-1)-2391)
(NYO-2391-120; Rept-1450) Avail: NTIS

An electric dipole active line in MnF2:Fe(2+) was observed by far infrared techniques at 144.9/cm at 1.2 K. The line is

observed only for E parallel to the optic axis. With increasing temperature the frequency of the line decreases, while the halfwidth, which is a few/cm at 1.2 K, increases strongly above 20 K. The temperature dependence of the absorption line and a very small magnetic field dependence indicate that the line is due to a pair mode process consisting of a simultaneous excitation of a Fe(2+) spin and a next nearest Mn(2+) spin. A Green's function calculation is used to fit the 1.2 deg data by appropriate choice of the impurity-host exchange constants between next nearest and nearest neighbors. Author

N71-15446# Idaho Nuclear Corp., Idaho Falls. National Reactor Testing Station.

VALENCE FORCE POTENTIALS FOR CALCULATING CRYSTAL VIBRATIONS IN SILICON

A. W. Solbrig, Jr. Sep. 1970 15 p refs

(Contract AT(10-1)-1230)

(IN-1424) Avail: NTIS

The valence force potential is tested by application to silicon. Least squares fit of the six valence force constants used for diamond yields agreement with experiment comparable to that obtained from a nine parameter shell model by Dolling. A fit with three more valence force constants yields agreement not quite so good as that obtained from an 11 parameter shell mode by Dolling. Parts of the calculated transverse acoustic branches fall systematically outside the experimental error bars. The valence force potential used contains only two types of valence coordinates (bond stretch and angle bend); nevertheless, this valence force potential seems to contain much of the physics of the phonon dispersion relations of silicon. Author

N71-15698# California Inst. of Tech., Pasadena. W. M. Keck Lab. of Engineering Materials.

A STUDY OF DISLOCATION MOBILITY AND DENSITY IN METALLIC CRYSTALS Annual Summary Report, Period Ending Jul. 1970

T. Vreeland, Jr. and David S. Wood Jul. 1970 22 p refs

(Contract AT(04-3)-767)

(CALT-767-P-3-14; ASR-8) Avail: NTIS

Research is reported aimed at determining the static and dynamic properties of dislocations in order to predict the deformation response of crystalline solids over a wide range of environmental parameters. Relatively high dislocation velocities at low stresses were observed in Al, Cu, and in the basal system of zinc. The observations indicate that the principle drag on moving dislocations in relatively perfect crystals of these metals is due to phonon-dislocation interactions. It was found that the interaction becomes weaker as the temperature is lowered, resulting in higher dislocation velocities for the same stress. A new low temperature etch was found to be effective for revealing dislocations intersecting a basal plane surface of zinc crystals. Large loop and spiral dislocations were observed below the basal plane surface of single crystals of zinc and methods for controlling the formation of these loops and spirals were developed. D.L.G.

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N71-14587# White Sands Missile Range, N.Mex.

THE DETERMINATION OF ALUMINUM AND CHLORINE IN COMPOSITE PROPELLANTS BY NON-DESTRUCTIVE ACTIVATION ANALYSIS USING A MIXTURE OF 14.5 MeV AND SLOW NEUTRONS

A. E. Richardson and Alex Harrison 1970 13 p refs

(AD-713575) Avail: NTIS CSCL 21/9

Aluminum and chlorine can be determined simultaneously with a precision of better than plus or minus 1% by activation analysis utilizing a mixture of 14.5 MeV and slow neutrons. The accuracy compares favorably with X-ray fluorescence and indicates that activation analysis can be a valuable method for the quality control of solid composite propellants. Author (TAB)

N71-14630*# Mathematical Applications Group, Inc., White Plains, N.Y.

A STUDY OF HIGH FREQUENCY NONLINEAR COMBUSTION INSTABILITY IN BAFFLED ANNULAR LIQUID PROPELLANT ROCKET MOTORS. VOLUME 2: A USER MANUAL FOR COMPUTER PROGRAMS TRDL AND TRDPLT Final Report, 25 Aug. 1969–25 Sep. 1970

Harold S. Schechter and Samuel Z. Burstein 31 Aug. 1970 63 p refs

(Contract NAS7-752)

(NASA-CR-115871; MR-7008-Vol-2) Avail: NTIS CSCL 21H

A computer program for a nonlinear evaporation rate controlling combustion instability model is described. All equations used in the model are listed. The methods used for the numerical solution of the equations are described. A complete description of the logic of the computer program is given together with its utilization. The format required for the input to the program is explained with a description of the output. Sample cases are provided. The utilization of a second program for plotting the results of the calculations is presented together with samples of the various plots that may be produced. Author

N71-14631*# Mathematical Applications Group, Inc., White Plains, N.Y.

A STUDY OF HIGH FREQUENCY NONLINEAR COMBUSTION INSTABILITY IN BAFFLED ANNULAR LIQUID PROPELLANT ROCKET MOTORS, VOLUME 1 Final Report, 25 Aug. 1969–25 Sep. 1970

Samuel Z. Burstein and Harold S. Schechter 31 Aug. 1970 126 p refs

(Contract NAS7-752)

(NASA-CR-115872; MR-7009-Vol-1) Avail: NTIS CSCL 21H

Computer experiments on the effect of baffles on the damping of bomb-like disturbances in simulated liquid rocket engines are reported. The method used is the direct numerical solution of the complete nonlinear gas dynamic equation with mass and energy sources in a cylindrical annular combustion chamber. Damping rates generally, although not always, increased with increase in baffle length. Drop size increase decreased oscillation amplitudes. Increasing the throat area significantly increased damping rates. The results of systematic variation of the mass flux, throat area, and baffle length on the pressure history in the chamber are reported. Author

N71-14642*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.

BEHAVIOR OF NOZZLES AND ACOUSTIC LINERS IN THREE-DIMENSIONAL ACOUSTIC FIELDS Quarterly Report, 1 Sep.–31 Nov. 1970

Ben T. Zinn, Allan J. Smith, Jr., and B. Robert Daniel 31 Nov. 1970 13 p refs

(Grant NGL-11-002-085)

(NASA-CR-102988) Avail: NTIS CSCL 21H

The behavior of nozzles and acoustic liners in three dimensional acoustic fields is discussed. Developments of techniques for optimization of microphone location, adaptation of a nonlinear regression technique to the reduction of experimental nozzle

admittance data obtained at a given frequency, and the refinement of the statistical curve fitting routine used to correlate the nozzle admittance data over a range of frequencies are presented. Author

N71-15139# Technological Lab. RVO-TNO, Rijswijk (Netherlands).
MEASUREMENT OF THE EFFECTIVE STABILIZER CONTENT IN PROPELLANTS (MES)
T. van de Putte 24 Sep. 1970 19 p refs
(TL-1970-17; TDCK-56472) Avail: NTIS

A method was developed which enables a rapid and accurate determination of the effective stabilizer content in propellants, the MES. The method is based on the measurement of the exothermal effect of the reaction between NO2 and the stabilizing compound. A complete performance of the test in duplicate takes about 60 minutes. It was shown that matrix effects have no influence on the measuring results. With the aid of the MES it is possible to determine the effective stabilizer content periodically from the date of production onwards and thus to get an impression of the aging of the propellant. In combination with data obtained from the isothermal heat generation meter it gives a more complete picture of the safety of the propellant in store. Author

N71-15291*# Martin Marietta Corp., Denver, Colo.
INVESTIGATION OF SPACE STORABLE PROPELLANT ACQUISITION DEVICES. VOLUME 1: EVALUATION Final Report, 24 Jul. 1969 – 15 Apr. 1970
Oct. 1970 273 p refs Prepared for JPL
(Contract NAS7-754)
(NASA-CR-111696; MCR-70-171-Vol-1) Avail: NTIS CSCL 21I

Acquisition, pressurization, and tankage propulsion subsystems were selected for Mars and Grand Tour spacecraft. The three baseline missions are two 1-yr Mars Orbiter missions and a 10-yr Grand Tour mission to the outer planets. The space storable propellants OF2 and B2H6 are used for one Mars orbiter, while the second uses N2O4 and CH3N2H3 (MMH) earth storables. A nitrated hydrazine monopropellant is employed for the Grand Tour spacecraft. Evaluations of propellant acquisition techniques, propellant tank configurations, and helium versus nitrogen stored-gas pressurization are presented. Surface tension devices are shown to be the best propellant acquisition concept for all three missions. For both Mars orbiters, a two-spherical propellant tank configuration is preferred; for the Grand Tour, the single tank should be spherical. Helium pressurant provides advantages over nitrogen for both of the separately stored Mars orbiter systems and for the Grand Tour blowdown pressurization system. The results also show that the Mars orbiters should employ a single pressurant storage sphere with helium stored at the nominal propellant temperature and an initial pressure of 4000 psia. Author

N71-15292*# Martin Marietta Corp., Denver, Colo.
INVESTIGATION OF SPACE STORABLE PROPELLANT ACQUISITION DEVICES. VOLUME 2: DESIGN AND ANALYSIS Final Report, Apr. – Aug. 1970
Dec. 1970 156 p refs Prepared for JPL
(Contract NAS7-754)
(NASA-CR-111343; MCR-70-171-Vol-2) Avail: NTIS CSCL 21I

Detailed analyses and designs of surface tension propellant acquisition systems were made for the three baseline missions. The first approach required that the surface tension system be tested under minus 1 g, i.e., gas-free liquid expelled from the inverted, full-scale propellant tank against the gravity vector. Under the second approach, the surface tension system was designed to perform reliably under the low-g operational environment only. Based on the surface tension designs, the Fruhof low-gravity propellant acquisition concept is preferred for each baseline mission. Author

N71-15321# Army Foreign Science and Technology Center, Washington, D.C.
ON THE ACOUSTIC CONDUCTANCE OF THE BURNING SURFACE OF POWDER [OBAKUSTICHESKOI PROVODIMOSTI GORYASHCHEI POVERKHNOSTI PORDKHA]
S. S. Novikov 28 Sep. 1970 10 p refs Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Moscow), no. 5, 1969 p 29 – 32
(AD-713753; FSTC-HT-23-1005-70) Avail: NTIS CSCL 20/1

The origination of acoustic instability of burning in solid fuel rocket engines is associated with the possibility of amplifying the sound waves during reflections from the burning surface of solid fuel. In the case of a ballistic powder, it is possible to derive an analytical formula and numerical values for acoustic conductance relying on completely specific experimental values for all parameters figuring in the basic equations. Given are the results of such calculations. Author (TAB)

N71-15378# Picatinny Arsenal, Dover, N.J.
THE PREPARATION AND PROPERTIES OF NEW OXIDIZERS FOR PROPELLANTS, NH4C104-KC104 and NH4C104-NH4NO3 MIXED CRYSTALS
Scott I. Morrow 1970 12 p refs
(AD-713564) Avail: NTIS CSCL 19/1

It was demonstrated that isomorphous and phase rule concepts can be used as a theoretical guide for obtaining valuable new oxidizer alloys. New synthesis techniques were explored to facilitate preparation of NH4ClO4-KClO4 and NH4ClO4-NH4NO3 alloys on an expanded scale. It was found that it was considerably more difficult to make the latter type of homogeneous mixed crystals. This was due to the theoretically predicted lack of ideality of the behavior of this salt pair in water. It was shown that introduction of NH4CLO4 into the crystal lattice of NH4NO3 tends to increase the latters thermal stability and decrease its sensitivity to moisture. At the same time NH4NO3 appears to reduce the impact sensitivity of NH4ClO4. These are desirable effects from a propellant and explosive standpoint. Author (TAB)

N71-15379*# Rocketdyne, Canoga Park, Calif.
LIQUID PHASE REACTIONS OF HYPERGOLIC PROPELLANTS Final Report
S. E. Rodriguez and A. E. Axworthy 1 Dec. 1970 79 p refs Prepared for JPL
(Contract NAS7-739)
(NASA-CR-115863; R-8374) Avail: NTIS CSCL 21H

Heat and gas release rates were measured for the initial reaction of liquid nitrogen tetroxide with hydrazine, monomethyl hydrazine, and unsymmetric dimethyl hydrazine. A free jet (60 deg) impingement technique was developed which permitted these rates to be measured for very short reaction times near 100 and 200 microseconds. A basic quench solution was required to obtain reproducible heats of quenching for the unreacted propellants. High rates of heat and gas release were measured. These were on the order of 100,000 kcal per mol NTO per second and 1000 mol gas per mole NTO per second, respectively. The order of reactivity with NTO was found to increase markedly in the series hydrazine < UDMH < MMH. Author

N71-15634* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
METHOD OF IGNITING SOLID PROPELLANTS Patent
Harrison Allen, Jr., Carl C. Ciepluch, and Edward A. Fletcher, inventors (to NASA) Issued 5 Jul. 1966 (Filed 13 Sep. 1963) 5 p Cl. 60-35.6 Continuation-in-part of US Patent Appl. SN-180370, filed 16 Mar. 1962
(NASA-Case-XLE-01988; US-Patent-3,258,912; US-Patent-Appl-SN-308918) Avail: US Patent Office CSCL 21I

A method of igniting solid propellant rocket motors by the injection of hypergolic fluids is described, wherein the igniting substance is concentrated on predetermined portions of the propellant. The method is not limited to any particular type of solid propellant, and the various types of injectors used with composite solid propellants are equally applicable to double-base propellant motors. Also, the hypergolic fluids are not limited to the chlorine trifluoride, bromine trifluoride, or bromine pentafluoride mentioned in this experiment. E.M.C.

N71-15635* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FLUID DISPENSING APPARATUS AND METHOD Patent

Solomon S. Papell, inventor (to NASA) Issued 5 Jul. 1966 (Filed 17 Nov. 1964) 4 p Cl. 60-39.46

(NASA-Case-XLE-01182; US-Patent-2,258,918; US-Patent-Appl-SN-411949) Avail: US Patent Office CSCL 21I

A method and feed system for separating and orienting the liquid and vapor phases of propellants in a zero gravity environment are described. To accomplish this, magnetic particles are dispersed throughout the fluid propellant and colloidally suspended therein. The magnetic particles adhere to the liquid portion of the fluid and are thus separated from the vapor phase. Once the liquid phase of the propellant is oriented and positioned at the pump inlet, it can be effectively transmitted through said pump to the rocket engine. Detailed descriptions accompany drawings of the device. E.M.C.

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magneto-hydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N71-14617# Air Force Systems Command, Wright-Patterson AFB, Ohio. Aero Propulsion Lab.

PARAMETERS AFFECTING THE MEASUREMENT OF AERO ENGINE EXHAUST SMOKE: A STATISTICAL ANALYSIS OF TEST DATA Technical Report, Sep. 1969 – Feb. 1970

Donald L. Champagne Aug. 1970 63 p refs

(AD-713612; AFAPL-TR-70-23) Avail: NTIS CSCL 21/5

The report describes a computerized statistical analysis of test data from engine smoke measurements. The analysis indicated that test data can be used to arrive at statistically meaningful conclusions about four measuring system parameters. Author (TAB)

N71-14619# Research Inst. of National Defence, Stockholm (Sweden).

RAM ENGINES WITH INTEGRATED STARTING STAGE RRX5 (KRP5). PROPOSAL FOR DESIGN AND CALCULATION OF PERFORMANCE OF A SOLID FUEL ROCKET MOTOR [RAMMOTOR MED INTEGRERAT STARTSTEG RRX5 (KRP5). FOERSLAG TILL UTFORMNING OCH BERAEKNING AV PRESTANDA FOER KRUTRAKETMOTORN]

Bert Andersson and Arnold Magnusson Jul. 1969 13 p In SWEDISH

(FOA-2-C-2331-46) Avail: NTIS

Theoretical calculations were carried out for a 'tube and rod charge' for the RRX5. An aluminium-enriched polybutadiene charge is proposed which gives a total thrust of 36,000 Ns. The corresponding value for the given nc-based propellent is 29,500 Ns maximum. Results are also given from experiments on a rocket igniter which is combined with the pyrotechnic for the ram engine phase. The results are favorable and an igniter of this type is suggested for preliminary trial in a full scale test. Author

N71-14822# Aerospace Research Labs., Wright-Patterson AFB, Ohio.

A COMPACT THRUST AUGMENTING EJECTOR EXPERIMENT Final Report

Richard B. Fancher Aug. 1970 54 p refs

(AD-713634; ARL-70-0137) Avail: NTIS CSCL 20/4

The report briefly reviews the potential momentum thrust performance of ejectors. In addition to thrust performance, an ejectors utility to a V/STOL propulsion system is determined by several other factors including ejector size and airducting requirements. A survey of previous ejector experimental results are presented for ejectors with inlet area ratios in the neighborhood of 15 to 20. A compact two-dimensional ejector experiment with an inlet area ratio of 19 is described. This ejector with a 1.9 area ratio exit diffuser achieved a thrust augmentation ratio of 1.71 and 1.78 for an ejector length to minimum channel width ratio of 3.5 and 5.1 respectively. It is believed that improvements in primary injection techniques were responsible for this favorable thrust performance. Author (TAB)

N71-15328*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.

EXPERIMENTAL EVALUATION OF A HONEYCOMB ROTOR SHROUD CONFIGURATION TO IMPROVE THE STALL MARGIN OF A 0.5 HUB-TIP RATIO SINGLE-STAGE COMPRESSOR. VOLUME 1: DATA AND PERFORMANCE REPORT

R. P. Oscarson and D. L. Wright Dec. 1970 95 p refs

(Contract NAS3-11158)

(NASA-CR-72808; PWA-FR-4008) Avail: NTIS CSCL 21E

A honeycomb rotor shroud-annular plenum configuration designed to increase compressor stable operating range and distortion tolerance was investigated in a 0.5 hub-tip ratio single-stage compressor. The honeycomb shroud resulted in a substantial increase in stall margin over that obtained with a solid shroud, for both uniform and distorted inlet flow. The honeycomb shroud caused a loss in efficiency which was attributed to flow recirculation in the rotor tip region. Author

N71-15329*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.

EXPERIMENTAL EVALUATION OF A HONEYCOMB ROTOR SHROUD CONFIGURATION TO IMPROVE THE STALL MARGIN OF A 0.5 HUB-TIP RATIO SINGLE-STAGE COMPRESSOR. VOLUME 2: DATA SUPPLEMENT

R. P. Oscarson and D. L. Wright Dec. 1970 282 p ref

(Contract NAS3-11158)

(NASA-CR-72809; PWA-FR-4163) Avail: NTIS CSCL 21E

Solid and honeycomb shroud configuration flow distribution data consisting of blade element performance and vector diagram data are presented in tables and graphs. Author

N71-15380*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

TURBOJET-RAMJET PROPULSION SYSTEM FOR ALL-BODY HYPERSONIC AIRCRAFT

Mark H. Waters Washington Jan. 1971 53 p refs

(NASA-TN-D-5993; A-3668) Avail: NTIS CSCL 21A

The characteristics of a parallel, over-and-under, turbojet-ramjet

propulsion system installed on an all-body Mach number 6 hypersonic aircraft are estimated, and the effect of variations in propulsion system parameters on payload and on problems of installation are determined. Engine thrust and fuel flow requirements are evaluated throughout acceleration and cruise, and the effects on the weights and dimensions of the propulsion system, including both inlets and engines, are determined. A wraparound turboramjet is also evaluated and comparisons with the parallel turbojet-ramjet system are made. Author

N71-15381# Naval Postgraduate School, Monterey, Calif.
COMPUTER PROGRAM FOR PREDICTION OF AXIAL FLOW TURBINE PERFORMANCE
Ennio Macchi Aug. 1970 104 p refs
(AD-713116; NPS-57-MA70081-A) Avail: NTIS CSCL 13/7

The report presents a computer program for prediction of performance of single-stage axial turbines of given geometry. The three-dimensional method developed by Vavra is applied, taking account of streamline curvatures and slopes, as well as enthalpy and entropy gradients in the solutions of the equation of motion, and of boundary layer thicknesses in the continuity equation. A choice among five different loss correlation methods and two flow angles correlations is offered. Loss coefficients and flow angles are automatically calculated from blading geometry and actual flow conditions for every streamline, according to the selected correlation method. Author (TAB)

N71-15424*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SOLID STATE SWITCHING MATRIX FOR SOLAR ELECTRIC PROPULSION
T. W. Macie 15 Dec. 1970 13 p
(Contract NAS7-100)
(NASA-CR-115900; JPL-TM-33-461) Avail: NTIS CSCL 21C

To reconnect an ion thruster from one power conditioner to another, a mechanical switching matrix is presently utilized. The current study compares the mechanical solution to a solid state solution using thyristors. The comparison of the two systems is based on a discussion and analysis of the following parameters: (1) configuration, (2) thyristor characteristics, (3) losses, (4) heat radiators, (5) total weight, and (6) reliability. Comparative conclusions are in terms of weight, size, reliability, and efficiency of the two systems. Also included is an appendix outlining the tradeoffs relating to choice of thyristors, as a further effort of system optimization. Author

N71-15563* Lockheed-California Co., Burbank.
ABSORPTIVE SPLITTER FOR CLOSELY SPACED SUPERSONIC ENGINE AIR INLETS Patents
Howard Kastan, inventor (to NASA) Issued 6 Sep. 1966 (Filed 8 Dec. 1964) 5 p Cl. 244-53 Sponsored by NASA
(NASA-Case-XLA-02865; US-Patent-3,270,990; US-Patent-Appl-SN-416946) Avail: US Patent Office CSLC 21A

An absorptive barrier assembly to be mounted between closely spaced jet engines is described for preventing interference effects due to shock waves from the engines. The barrier includes a solid plate which isolates the air inlets by preventing shock waves generated by one engine from reaching the other. In addition the barrier is nonreflective and does not reflect shock waves back to the engine generating the waves. The barrier is made nonreflective by attaching perforated arcuate side panels to each side of the solid plate. N.E.N.

N71-15658* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD OF MAKING A ROCKET MOTOR CASING Patent
Edward F. Baehr, inventor (to NASA) Issued 7 Jun. 1967 (Filed 4 Jan. 1963) 5 p Cl. 29-157
(NASA-Case-XLE-00409; US-Patent-3,254,395; US-Patent-Appl-SN-249539) Avail: US Patent Office CSCL 21H

Additional claims are made for a regeneratively cooled rocket motor casing. For abstract see N71-15659. Emphasis is placed on the method of shaping the casing. R.B.

N71-15659* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ROCKET MOTOR CASING Patent
Edward F. Baehr, inventor (to NASA) Issued 7 Jun. 1966 (Filed 30 Sep. 1965) 5 p Cl. 60-35.60 Continuation-in-part of US Patent Appl. N-249539, filed 4 Jan. 1963
(NASA-Case-XLE-05689; US-Patent-3,254,487; US-Patent-Appl-SN-491845) Avail: US Patent Office CSCL 21H

A regeneratively cooled rocket motor casing is described that comprises a group of channels attached to each other in such a way that each channel is tapered to provide a thickness at each cross section which meets the necessary strength requirements without excessive weight. A minimum thickness is provided at each channel cross section that is consistent with the local channel span and differential pressure load. This is accomplished by utilizing a sheet of stock having a tapered thickness in certain areas and removing a group of pattern outlined blanks from the sheet. The blanks are then bent to form channels having webs and ribs of varying thicknesses. R.B.

N71-15660* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INJECTOR ASSEMBLY FOR LIQUID FUELED ROCKET ENGINES Patent
William J. D. Escher, inventor (to NASA) Issued 6 Sep. 1966 (Filed 23 Jan. 1964) 7 p Cl. 60-35.6
(NASA-Case-XMF-00968; US-Patent-3,270,499; US-Patent-Appl-SN-339825) Avail: US Patent Office CSCL 21H

A propellant injection assembly having removable and replaceable parts, which is used in liquid fueled rocket engines, is described. A single injector assembly with a simple backplate has a group of apertures into which replaceable propellant injection nozzles can be fitted. Each injection nozzle includes a passageway connecting the propellant manifold at one end and the combustion chamber at the other. Flanges extending outwardly in a plane parallel to the plane of the backplate are formed on the end of the injection nozzles facing the combustion chamber. Each of the individual injector nozzles can be removed or replaced separately from the other injector nozzles. R.B.

N71-15661* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELECTROSTATIC ION ROCKET ENGINE Patent
Paul D. Reader and Harold R. Kaufman, inventor (to NASA) Issued 26 Jul. 1966 (Filed 18 Jan. 1965) 5 p Cl. 60-35.5
(NASA-Case-XLE-02066; US-Patent-3,262,262; US-Patent-Appl-SN-426455) Avail: US Patent Office CSCL 21C

An electron bombardment ion rocket engine having an improved propellant introduction system is described. The propellant is introduced into the ion chamber about the periphery of the accelerator system to produce a uniform ion current across the grid. The uniform current profile permits the current and thrust densities to increase significantly for a given accelerator lifetime. This is achieved by matching the propellant distribution and the ionizing electron distribution to more closely approximate a uniform ion production rate at the plane of the accelerator system. R.B.

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also 13 Geophysics; and 24 Physics, Atomic, Molecular, and Nuclear.

N71-14502# Osservatorio Astronomico, Trieste (Italy).
SOLAR RADIOASTRONOMY INSTRUMENTAL PROGRESSES AND RESEARCHES, 1969–1970 Final Scientific Report
Alberto Abrami and Giorgio Sedmak 1 Apr. 1970 29 p refs
(Contract AF 61(052)-926)
(AD-713218; AFCRL-70-0407) Avail: NTIS CSCL 3/2

Observations of the solar radio flux density were undertaken in March 1966 and pursued in the following years with the aim of studying the radio outbursts correlated with chromospheric flares. A ten-meter parabolic reflector has been planned and constructed for the ovservations of flux density and polarization in ten frequency bands between 200 and 1000 Mc/sec. The work done until Feb. 28 1969 is related to the measures at the single frequency of 239 Mc/sec, in one polarization only, but with low and high resolution recording devices. The authors have pointed out the usefulness of the high resolution techniques for the studies of the microstructures of the radio outbursts which present, sometimes, a very interesting periodic fluctuation, stationary over limited time intervals. The studies on this subject are still in progress, and will be usefully integrated by the polarization measurements, when the polarimetric radiometers are completed. Author (TAB)

N71-14516# Michigan Univ., Ann Arbor. Dept. of Astronomy.
THE SOLAR CHROMOSPHERE AND HIGH ENERGY RADIATION Technical Report, 1 Jul. 1969–30 Sep. 1970
H. D. Prince 30 Sep. 1970 8 p
(Contract Nonr-1224(19))
(AD-713229) Avail: NTIS CSCL 3/2

The report discusses work under the contract in the following areas. Studies in solar spectroscopy; Observations of sunspots; Studies of flares and flare-rich centers of activity; and Time variations in Solar activity. TAB

N71-14557# Air Force Cambridge Research Labs., Bedford, Mass.
AURORAL OVAL PLOTTER AND NOMOGRAPH FOR DETERMINING CORRECTED GEOMAGNETIC LOCAL TIME, LATITUDE, AND LONGITUDE FOR HIGH LATITUDES IN THE NORTHERN HEMISPHERE
James A. Whalen 27 Jul. 1970 33 p refs *Its* Environ Res. Papers, No. 327
(AD-713170; AFCRL-70-0422) Avail: NTIS CSCL 4/1

A nomographic computer is presented which graphically converts geographical coordinates and universal time into geomagnetic coordinates and geomagnetic local time in the Corrected Geomagnetic system of Hultqvist. The computer is formulated as a map of high latitudes in the Northern Hemisphere on which the position of the auroral oval can be projected directly for any time of day, for any magnetic activity, with account being taken of seasonal variation of the geomagnetic local time coordinate. Instructions for its use, discussion of its accuracy, and examples of its application are given. Author (TAB)

N71-14563# New Hampshire Univ., Durham. Dept. of Physics.
COSMIC-RAY MODULATION DURING FORBUSH DECREASES IN 1968–1969
John A. Lockwood and Partap Singh Aug. 1970 15 p refs
(Contract F19628-68-C-0107; Grant NSF GA-1106)
(AD-713226; Scientific-2; AFCRL-70-0470) Avail: NTIS CSCL 3/2

For several Forbush decreases in 1968-69 analyses have been made of the counting rate variations of neutron monitors at different vertical cutoff rigidities, of the different neutron multiplicities recorded by the Mt. Washington and Durham monitors, and of the cosmic ray telescope on Pioneer 8. Comparisons of the Forbush decrease changes with those for the 11-year variation indicate that the Forbush decreases are less rigidity dependent. From these data a possible form for the rigidity modulation is obtained. Author (TAB)

N71-14908# Aerospace Corp., El Segundo, Calif. Lab. Operations.
BASIC PROCESSES AND CROSS SECTIONS IN PROTON AURORAS, 15 MAY–15 AUGUST 1970
Robert J. McNeal and John H. Birely 8 Sep. 1970 19 p refs
(Contract F04701-70-C-0059)
(AD-713691; TR-0059(9260-01)-10; SAMSO-TR-70-372) Avail: NTIS CSCL 4/1

A proton aurora is a weak, diffuse emission readily identified by Doppler-shifted hydrogen lines in its spectrum. It is caused by precipitation of protons with a broad energy distribution that peaks near 1 ke V. For theoretical analysis of this aurora, cross sections for ionization and excitation of atmospheric constituents by energetic protons and hydrogen atoms are needed over a wide energy range. Recent measurements of these cross sections are reviewed in this paper, and preliminary results from this laboratory for excitation of some of the hydrogen emissions are reported. Author (TAB)

N71-15256# Environmental Data Service, Silver Spring, Md.
SOLAR-GEOPHYSICAL DATA: COMPREHENSIVE REPORTS, NO. 307, PART 2, AUGUST–SEPTEMBER 1969 AND MISCELLANEA
Hope I. Leighton, ed. Mar. 1970 91 p
(ESSA-SGD-307-Pt-2) Avail: SOD $1.25

Hourly data records of solar activity and sudden ionospheric disturbances for August are given. The material presented for September includes the following data categories: (1) solar flares; (2) solar radio waves; (3) solar X-ray radiation (4) solar proton monitoring; and (5) magnetograms of geomagnetic storms. D.L.G.

N71-15257# Environmental Data Service, Silver Spring, Md.
SOLAR-GEOPHYSICAL DATA: COMPREHENSIVE REPORTS, NO. 304, PART 2, MAY–JUNE 1969 AND MISCELLANEA
Hope I. Leighton, ed. Dec. 1969 111 p
(ESSA-SGD-304-Pt-2) Avail: SOD $1.25

The material presented for May includes: (1) hourly records of solar activity and sudden ionospheric disturbances, and (2) solar X-ray radiation observations from Explorer satellites 33 and 35. Data categories for June include: (1) solar flares; (2) solar radio waves, (3) solar X-ray radiation, (4) solar proton monitoring, and (5) magnetograms of geomagnetic storms. D.L.G.

N71-15258# Environmental Data Service, Silver Spring, Md.
SOLAR-GEOPHYSICAL DATA: PROMPT REPORTS NO. 305, PART 1, NOVEMBER–DECEMBER 1969
Hope I. Leighton, ed. Jan. 1970 96 p refs
(ESSA-SGD-305-Pt1) Avail: SOD $1.25

The solar and geophysical data for November includes the following categories: (1) daily solar activity centers, (2) solar X-ray radiation, (3) sudden ionospheric disturbances, (4) solar radio waves, (5) cosmic rays, (6) geomagnetic indices, and (7) radio propagation indices. Data categories for December include: (1) alert periods, (2) daily solar indices, (3) sudden ionospheric disturbances, (4) solar radio waves, (5) solar wind, and (6) cosmic ray protons. D.L.G.

N71-15259# Environmental Data Service, Silver Spring, Md.
SOLAR-GEOPHYSICAL DATA: COMPREHENSIVE REPORTS, NO. 305, PART 2, JUNE–JULY 1969 AND MISCELLANEA
Hope I. Leighton, ed. Jan. 1970 88 p refs
(ESSA-SGD-305-Pt-2) Avail: SOD $1.25

Hourly data records of solar activity and sudden ionospheric disturbances for June are given. The material presented for July includes the following data categories: (1) solar flares; (2) solar radio waves; (3) solar X-ray radiation; (4) solar proton monitoring; and (5) magnetograms of geomagnetic storms. D.L.G.

N71-15260# Environmental Data Service, Silver Spring, Md.
SOLAR-GEOPHYSICAL DATA: COMPREHENSIVE REPORTS, NO. 306, PART 2, JULY–AUGUST 1969 AND

MISCELLANEA
Hope I. Leighton, ed. Feb. 1970 101 p
(ESSA-SGD-306-Pt-2) Avail: SOD $1.25

Hourly data records of solar activity and sudden ionospheric disturbances for July are given. The material presented for August includes the following data categories: (1) solar flares, (2) solar radio waves, (3) solar X-ray radiation, (4) solar proton monitoring, and (5) magnetograms of geomagnetic storms. D.L.G.

N71-15285# Environmental Data Service, Silver Spring, Md.
SOLAR-GEOPHYSICAL DATA: PROMPT REPORTS, NO. 306, PART 1, DECEMBER 1969–JANUARY 1970
Hope I. Leighton, ed. Feb. 1970 96 p
(ESSA-SGD-306-Pt-1) Avail: SOD $1.25

The solar and geophysical data for December includes the following categories: (1) daily solar activity centers, (2) solar X-ray radiation, (3) sudden ionospheric disturbances, (4) solar radio waves, (5) cosmic rays, (6) geomagnetic indices, and (7) radio propagation indices. Data categories for January include: (1) alert periods, (2) daily solar indices, (3) sudden ionospheric disturbances, (4) solar radio waves, (5) solar wind, and (6) cosmic ray protons. D.L.G.

N71-15286# Environmental Data Service, Silver Spring, Md.
SOLAR-GEOPHYSICAL DATA: PROMPT REPORTS, NO. 307, PART 1, JANUARY–FEBRUARY, 1970
Hope I. Leighton, ed. Mar. 1970 101 p
(ESSA-SGD-307-Pt-1) Avail: SOD $1.25

The solar and geophysical data for January includes the following categories: (1) daily solar activity centers, (2) solar X-ray radiation, (3) sudden ionospheric disturbances, (4) solar radio waves, (5) cosmic rays, (6) geomagnetic indices, and (7) radio propagation indices. Data categories for February include: (1) alert periods, (2) daily solar indices, (3) sudden ionospheric disturbances, (4) solar radio waves, (5) solar wind, and (6) cosmic ray protons. D.L.G.

N71-15287# Environmental Data Service, Silver Spring, Md.
SOLAR-GEOPHYSICAL DATA: PROMPT REPORTS, NO. 304, PART 1, OCTOBER–NOVEMBER 1969
Hope I. Leighton, ed. Dec. 1969 104 p
(ESSA-SGD-304-Pt-1) Avail: SOD $1.25

The solar and geophysical data for October includes the following categories: (1) daily solar activity centers, (2) solar X-ray radiation, (3) sudden ionospheric disturbances, (4) solar radio waves, (5) cosmic rays, (6) geomagnetic indices, and (7) radio propagation indices. Data categories for November include: (1) alert periods, (2) daily solar indices, (3) sudden ionospheric disturbances, (4) solar radio waves, (5) solar wind, and (6) cosmic ray protons. D.L.G.

N71-15322*# California Inst. of Tech., Pasadena.
[COSMIC RAYS, INTERPLANETARY MAGNETIC FIELDS AND PLASMA RESEARCH] Semiannual Status Report, 1 Apr.–30 Sep. 1970
30 Sep. 1970 31 p refs
(Grant NGR-05-002-160)
(NASA-CR-115850) Avail: NTIS CSCL 03B

The astrophysical aspects of cosmic radiation, and the radiation environment of the earth are investigated by means of particle detector systems flown on spacecraft and balloons. The following types of experiments are reported: (1) experiments on NASA spacecraft, (2) experiments performed under NASA balloon program, (3) particle acceleration, (4) cosmic rays, and (5) interplanetary magnetic field and plasmas. F.O.S.

N71-15326# Aerospace Corp., El Segundo, Calif. Lab. Operations.
VARIATION IN OVII X-RAY LINE EMISSION FROM THE SOLAR CORONA, FEBRUARY–JULY 1970
Hugo R. Rugge and Arthur B. C. Walker, Jr. 15 Oct. 1970 24 p refs
(Contract F04701-70-C-0059)
(AD-713112; TR-0059(9260-02)-3; SAMSO-TR-70-358) Avail: NTIS CSCL 3/2

The variation in intensity of the solar x-ray resonance intercombination and forbidden lines of helium-like OVII with 2800 MHz solar radio flux is presented for three solar rotations. A high correlation (r approximately equal to 0.80) exists between the intensities of all three x-ray lines and the 2800 MHz solar flux. The ratio of the forbidden to the intercombination line intensities is found to be essentially independent of long term solar activity. This ratio is used to determine upper limits on the coronal electron density and to make inferences concerning the change in density with solar activity. Author (TAB)

N71-15327*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMMENTS ON WAVES AND DISCONTINUITIES IN THE SOLAR WIND
N. F. Ness, L. F. Burlaga, K. W. Ogilvie, and J. W. Sari Dec. 1970 10 p refs Submitted for publication
(NASA-TM-X-65411; X-692-70-460) Avail: NTIS CSCL 03B

A defense of work on waves and discontinuities, against disagreements by other researchers is presented. The waves and discontinuities are discussed in terms of distinguishing microscale phenomena from larger scale phenomena. The statistical properties of discontinuities as influenced by plasma data are analyzed. F.O.S.

N71-15405# Environmental Data Service, Silver Spring, Md.
SOLAR-GEOPHYSICAL DATA: DESCRIPTIVE TEXT, NO. 306, SUPPLEMENT
Hope I. Leighton, ed. Feb. 1970 81 p refs
Avail: SOD $0.75

A description and index of data contained in the monthly publication Solar-Geophysical data are presented. The publication is intended to keep research workers abreast of the major particulars of solar activity and the associated ionospheric, radio propagation and other geophysical effects. A complete index for data since July 1957 is given. D.L.G.

N71-15490# Joint Publications Research Service, Washington, D.C.
AURORAL STUDIES AT CONJUGATE POINTS
S. I. Isayev 18 Dec. 1970 17 p refs Transl. into ENGLISH of the book 'Kompleksnyye Issledovaniye Polyarnoy Ionosfery' Leningrad, Izd'Vo Nauka, 1970 p 3–18
(JPRS-52023) Avail: NTIS

A literature survey is presented on aurora investigations at conjugate points using visual, photographic, and photoelectric data. The conjugacy of auroral hydrogen emission is discussed and trends in the study of auroras at conjugate points are specified. E.C.

N71-15491*# California Univ., Berkeley. Space Sciences Lab.
STUDY OF X-RAY EMISSION FROM SELECTED REGIONS OF THE SOUTHERN HEMISPHERE SKY Summary Report
C. Stuart Bowyer 1 Jan. 1971 9 p *its* Space Sci. Lab. Ser. 11, Issue 90
(Grant NGR-05-003-278)
(NASA-CR-115906) Avail: NTIS

Results of X-ray analyses are summarized as well as data on sounding rocket flights, ground-based studies, and instrument development. E.C.

N71-15554 California Univ., San Diego.
THE BEHAVIOR OF COSMIC RAYS IN THE

INTERPLANETARY MEDIUM
Lennard Ayres Fisk, Jr. (Ph.D. Thesis) 1969 206 p
Avail: Univ. Microfilms: HC $9.45/Microfilm $3.00 Order No. 70-4284

The behavior of the anisotropy during solar cosmic ray events is discussed in terms a simple model in which the cosmic ray particles propagate along the mean interplanetary magnetic field, undergoing pitch angle scattering. A solution of the time-dependent Fokker-Planck equation which governs particle behavior during a model solar cosmic ray event allowing for convection, diffusion, and energy changes is presented. On the basis of this solution it is concluded that in solar cosmic ray events convection by the solar wind and energy changes are likely to have significant effects, especially on the rate of decay of the intensity with time. The equations governing the solar modulation of galactic cosmic rays allowing for convection, diffusion, and energy changes are approximated with simpler, more manageable equations which describe the particle behavior in a limited energy range. Dissert. Abstr.

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also; 11 Facilities, Research and Support; and 31 Space Vehicles.

N71-14561*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ACCURACY OF ESTIMATING THE LOCATION OF A LANDED SPACECRAFT ON MARS FROM RANGE AND RANGE-RATE DATA
W. Thomas Blackshear and James R. Williams Washington Jan. 1971 37 p refs
(NASA-TN-D-6109; L-7367) Avail: NTIS CSCL 22A

Standard deviations of parameters defining the location of a landed spacecraft on the surface of Mars are generated by assuming earth-based range and range rate tracking of the landed spacecraft. These statistics are presented parametrically for several tracking schedules. The covariance matrix for the spacecraft location includes effects of data measurement errors, and of model uncertainties in the tracking station locations, in the ephemeris of Mars, and in the Martian rotational period and rotational axis orientation. Comparisons are presented between the accuracies resulting from analysis of range and range rate data independently and in combination. Author

N71-14615# Instituto de Investigaciones de la Teoria de la Cosmovision, Buenos Aires (Argentina).
THE THEORY OF COSMIC VISION, THE CONQUEST OF THE MOON, AND THE UBIQUITY OF MAN IN THE SPACE AGE
Esteban Lisa 1970 46 p refs In SPANISH
Avail: NTIS

The historical developments in space science that led to the successful flight of Apollo 11 are reviewed. The flights are considered to be in agreement with the ideas of Newton, Galileo, Kepler, Copernicus, and Einstein concerning the harmony of the universe. Transl. by F.O.S.

N71-14636*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CRATER SIZE AND IMPACT FLASH PREDICTED FOR THE S-4B STAGE LUNAR IMPACT ON APOLLO 13 FLIGHT
David W. Jex and Geoffrey Hintze 10 Dec. 1970 19 p refs
(NASA-TM-X-64517) Avail: NTIS CSCL 03B

Both theory and empirical relations were used to obtain a meaningful conclusion on crater size and impact flash. The crater diameter for the S-4B stage impact was determined to be approximately 40 meters. It was concluded that very small chances exist for observation of the impact flash from earth-based stations. The maximum flash expected is of the order of a 16th magnitude star. In the soil of two of the six laboratory impact craters glassy spheres were found similar to the spheres found in the Apollo 11 lunar soil sample. Author

N71-14637*# Texas Univ., Dallas.
MULTIDISCIPLINARY RESEARCH IN SPACE-RELATED SCIENCE AND TECHNOLOGY Annual Report
1 Dec. 1970 121 p refs
(Grant NGL-44-004-001)
(NASA-CR-115879) Avail: NTIS CSCL 05A

The general objective of the research program is to investigate the structure of the solar system and its components and the evolutionary paths by which the present organizational state was reached. Specific areas of research are devoted to atmospheric structure, ionospheric structure, atmospheric chemistry and reaction kinetics, numerical mathematical techniques, balloon sounding, seismology, petrology and geochemistry, the conductivity of the earth's crust and upper mantle, magnetic properties of earth and lunar materials, and relativity. R.B.

N71-14658# Joint Publications Research Service, Washington, D.C.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 240
10 Nov. 1970 49 p refs Transl. into ENGLISH from various Sino-Soviet Bloc publications
(JPRS-51760) Avail: NTIS

CONTENTS:
1. ASTRONOMY p 1–7 refs (See N71-14657 05-30)
2. METEOROLOGY p 8–13 refs (See N71-14658 05-20)
3. OCEANOGRAPHY p 14–20 refs (See N71-14659 05-13)
4. TERRESTRIAL GEOPHYSICS p 21–24 refs (See N71-14660 05-13)
5. UPPER ATMOSPHERE AND SPACE RESEARCH p 28–43 refs (See N71-14661 05-13)
6. SUPPLEMENT: "SOYUZ" COMMAND MODULE p 45–51 (See N71-14662 05-31)

N71-14657# Joint Publications Research Service, Washington, D.C.
ASTRONOMY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 240 10 Nov. 1970 p 1–7 refs (See N71-14658 05-30)
Avail: NTIS

News items and research abstracts on the following topics are summarized: launch of a rocketborne astrophysical observatory to study the sun; manufacture of a mirror for a large telescope; installation of a solar coronagraph; manufacture of an automatic instrument for determining radiotelescope mirror coordinates; flight of an automatic stratospheric observatory; analyses of a weak chromospheric flare and a strong solar flare; observations of circularly polarized radio emission during solar flares; long-range forecasts of total sunspot area; longitudinal distribution of S-component sources of solar radio emission; statistical analysis of constant and slowly changing components of solar radio emission; overexcitation of hydrogen upper energy levels in flare; and Venera 5 and Venera 6 measurements of Venusian atmospheric dynamics. E.C.

N71-14884*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
APOLLO 7 RETROFIRE AND REENTRY OF SERVICE PROPULSION MODULE. FURTHER STUDY OF INTELSAT 2 F-2 APOGEE BURN
Mary Grandfield, Daniel Hanlon, Karen Hebb, Edward Jantsch, Robert Yorke et al 4 Apr. 1969 40 p refs
(NGR-09-015-002)
(NASA-CR-115869; SAO-Special-Rept-298) Avail: NTIS CSCL 22C

A preliminary analysis of the photographs of the Apollo 7 deorbit maneuver and observations of the service propulsion module reentry are presented. Also discussed are Baker-Nunn camera photographs of the firing of the apogee motor of the Intelsat 2 F-2 communications satellite. A.L

N71-14887*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LUNAR HADLEY RILLE: CONSIDERATIONS OF ITS ORIGIN
Ronald Greeley Jan. 14 p refs
(NASA-TM-X-62011) Avail: NTIS CSCL 03B

Geomorphology, topographic configuration, comparisons with terrestrial analogs, and considerations of the chemical and physical characteristics of mare lavas indicate that the Hadley Rille is a lava channel. Some of the structure was roofed to form a lava tube, parts of which have subsequently collapsed. Author

N71-14909*# National Academy of Sciences-National Research Council, Washington, D.C. Space Science Board.
LIFE SCIENCES IN SPACE
H. Bentley Glass, ed. 1970 59 p
(Contract NSR-09-012-088)
(NASA-CR-115873) Avail: NTIS CSCL 06B

In response to a NASA request for a review of future life sciences activities, the National Academy of Sciences made the following recommendations: (1) appointment of a Life Sciences Advisory Board at high administrative level within NASA; (2) creation of a new Office of Space Biology and Medicine; (3) reorganize life sciences programs into four units: exobiology and planetary ecology, space biology, human biology and aerospace medicine, and personnel health and environmental medicine; (4) simplification of advisory structure; (5) establishment of better criteria for selection of flight experiments; (6) establishment of NASA Life Scientist Program composed of 40 life scientists appointed to six year terms; (7) broader dissemination of information to university staffs and students; (8) increased international participation and cooperation; (9) search for life on other worlds and deeper understanding of origin of life remain prime scientific priority; (10) reevaluation of astronaut selection criteria and progressive transfer to trained scientists; and (11) fundamental studies in space biology, and the supporting ground based experiments continue to receive support. A.L

N71-14910# Stanford Univ., Calif. Inst. for Plasma Research.
REDSHIFT DISTRIBUTION OF QUASI-STELLAR OBJECTS AND THE RADIO SOURCE COUNTS
Vahe Petrosian Sep. 1970 14 p refs Presented at the IAU 44th Symp., Uppsala, 10–14 Aug. 1970
(Contract N00014-67-A-0112-0006)
(AD-713189; SU-IPR-392) Avail: NTIS CSCL 3/2

The authors discuss the large scale redshift distribution of QSOs to determine their evolution and reality of the apparent cut-off in their distribution for redshift z greater than or equal to 2.3, in the relativistic cosmological model with zero cosmological constant and with deceleration parameter q sub zero = +1. The authors do not discuss the distribution in the Lamaitre models which were introduced in 1967 (Petrosian et. al.) and have been reviewed recently (Petrosian and Salpeter 1970). In a recent article (Petrosian 1970) the authors have shown that the density evolution derived by Schmidt (1968) from the data on 33 3CR quasi-stellar radio sources (QSRs) cannot continue beyond z approximately equal to 2.2. In the report the authors discuss possible evolutions of sources for z greater than 2.2, then based on these models the authors calculate the contribution of QSRs to the radio source counts. Author (TAB)

N71-14911# Manchester Univ. (England). Dept. of Astronomy.
RELATIVE HEIGHTS OF PHOTOGRAPHIC FEATURES OF THE MOON Scientific Report, 16 Jan. 1969 – 15 Mar. 1970
Zdenek Kopal and Michael Moutsoulas Jun. 1970 24 p
(Contract F61052-68-C-0002)
(AD-713679; AFCRL-70-0487; Rept-0002-2) Avail: NTIS CSCL 3/1

The aim of the report is to give an account of the research developed between January 1969 and March 1970 in pursuit of the main objectives of work sponsored by the contract. An account of the estimated reduction errors is given and coordinates of lunar features referred to a system of axes parallel to the projection of the ecliptic coordinates on the photographic plate are presented for four plates. A selection of lunar reference points considered at most suitable for selenodetic work is presented. Author (TAB)

N71-14954*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLANETARY FLIGHT PROJECTS
In its Space Programs Sum. No. 37-65, Vol. 2 for the period 1 Jul. – 31 Aug. 1970. The Deep Space Network 30 Sep. 1970 p 14–23 (See N71-14951 06-04)
Copyright. Avail: NTIS CSCL 22A

Tracking support by the Deep Space Network for the Mariner Mars 1969 extended operations and Mariner Mars 1971 missions is discussed. The objectives of each mission and the type of support given by the DSN are presented. R.B.

N71-15137# Republic Observatory, Johannesburg (South Africa).
THIRD CATALOGUE OF ORBITS OF VISUAL BINARY STARS, VOLUME 7, NO. 129
W. S. Finsen and C. E. Worley 1970 54 p refs
Avail: NTIS

For each orbit the Thiele-Innes elements were recomputed from the published Campbell elements or vice versa. Astrometric and hyperbolic orbits are included. The catalog is a compilation of visual binary orbits published earlier and independently. R.B.

N71-15191# Republic Observatory, Johannesburg (South Africa).
REPUBLIC OBSERVATORY CIRCULARS, VOLUME 7, NO. 130
1970 7 p
Avail: NTIS

Tabular data are presented for photographic observations of minor planets, micrometer measures of double stars, photometric observations of binary stars, and the orbit of phi 312 epsilon Cet. R.B.

N71-15204*# California Univ., Berkeley. Space Sciences Lab.
LUNAR SURFACE ENGINEERING PROPERTIES EXPERIMENT DEFINITION. VOLUME 1: MECHANICS AND STABILIZATION OF LUNAR SOILS Final Report, 20 Jun. 1969 – 19 Jul. 1969
James K. Mitchell and William W. Houston Jan. 1970 166 p refs
(Contract NAS8-21432)
(NASA-CR-102963) Avail: NTIS CSCL 03B

A simulated lunar soil was prepared to study general lunar soil properties for determining the feasibility of proposed geotechnical

tests for Apollo missions. The study indicates that the average density of the top 40 cm of lunar soil is slightly higher than 1.50 g/cu cm, and that the density probably varies from one location to another due to vibrations of the lunar surface. To determine the effect of the possible variations in soil condition on the performance of a lunar roving vehicle the basic relationships of thrust, motion resistance, draw-bar pull, and wheel and soil parameters were investigated. Foamed plastic chemical systems for lunar soil stabilization were also investigated. F.O.S.

N71-15205*# California Univ., Berkeley. Space Sciences Lab.
LUNAR SURFACE ENGINEERING PROPERTIES EXPERIMENT DEFINITION. VOLUME 2: LUNAR SOIL PROPERTIES FROM PHOTOGRAPHIC RECORDS Final Report, 20 Jun. 1968 – 19 Jul. 1969
James K. Mitchell Jan. 1970 106 p refs
(Contract NAS8-21432)
(NASA-CR-102960) Avail: NTIS CSCL 03B

Lunar Orbiter photographs of boulder tracks left on the lunar surface by the boulders as they rolled down slopes were studied to determine the soil strength parameters of cohesion and angle of internal friction. The methods used for the analysis consisted of: (1) locating suitable tracks on high resolution photographs, (2) determining the scale of the photograph, (3) measuring the boulder and track dimensions, (4) estimating the slope angle for selected protons of the tracks, and (5) reviewing tentative geological information for evaluation of assumptions regarding cohesion and density. It is concluded that the analysis of lunar slopes using dynamic considerations and Orbiter photographs is not a fruitful approach for quantitative determination of lunar soil strength parameters. F.O.S.

N71-15206*# California Univ., Berkeley. Space Sciences Lab.
LUNAR SURFACE ENGINEERING PROPERTIES EXPERIMENT DEFINITION. VOLUME 3: BOREHOLE PROBES Final Report, 20 Jun. 1968 – 19 Jul. 1969
Richard E. Goodman, Karel Drozo, and Francois E. Heuze Jan. 1970 225 p refs
(Contract NAS8-21432)
(NASA-CR-102961) Avail: NTIS CSCL 03B

The failure mechanisms associated with the use of a borehole jack in rocks is investigated based on assumed boundary conditions. The failure of circular boreholes by penetrometer loading, dialometer loading, and quadrantal jack loading are discussed, and the experimental work related to borehole jack probes and testing is reported. Results for the finite element analysis of the borehole jack problems are summarized. F.O.S.

N71-15207*# California Univ., Berkeley. Space Sciences Lab.
LUNAR SURFACE ENGINEERING PROPERTIES EXPERIMENT DEFINITION Summary Technical Report
James K. Mitchell, Karel Drozo, Richard E. Goodman, Francois E. Heuze, William N. Houston et al Jan. 1970 38 p refs
(Contract NAS8-21432)
(NASA-CR-102962) Avail: NTIS CSCL 03B

Summaries of the studies of the simulation, properties, stabilization, and strength parameters of lunar soil are presented with an investigation of the means for measuring the permeability of lunar soils and rocks in situ. The concept of local similarity on which this work in gas flow is based include the following assumptions: (1) flow is steady, (2) flow is independent of the initial pressure in the porous medium, (3) a single length characterizes the fluid conductivity of the porous medium, (4) flow is isothermal, and (5) the porous medium is isotropic. Recommendations, relative to the solution of critical problems concerning the behavior of lunar surface materials and their effects on scientific exploration and development of the moon, are included. F.O.S.

N71-15272*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ORBITAL EVOLUTION OF LOST CITY METEORITE
Barbara E. Lowrey Dec. 1970 20 p refs Submitted for publication
(NASA-TM-X-65407; X-644-70-444) Avail: NTIS CSCL 03B

The orbit of the Lost City meteorite is investigated to determine the influence of secular and encounter perturbations on the orbital evolution. Secular perturbations are negligible in the interval of 300 to 400 years and encounter perturbations highly unlikely, so therefore it is valid to interpret the short lived cosmic radiogenic isotopes as having formed in the current orbit. During a 40,000 year numerical integration, the maximum inclination was 16 deg, minimum 9.7 deg, the minimum eccentricity was .414, maximum .447. Over a 500,000 year interval, it was found that the very long period secular terms were effective in preventing earth encounters for a substantial fraction of the time, suggesting the hypothesis that the meteor was a surviving remnant of the early Solar System ought not be completely dismissed. Author

N71-15323*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TWO OVER MARS: MARINER 6 AND MARINER 7, FEBRUARY–AUGUST 1969
James H. Wilson [1970] 44 p refs
(Contract NAS7-100; Proj. Mariner Mars 1969)
(NASA-CR-115853; NASA-EP-90) Avail: SOD CSCL 22C

The technical characteristics, engineering development, flight performance, and scientific results of Mariner Mars 1969 are described. This document is intended to serve as an integrated introduction in narrative form, technically valid but not burdened with detail, to the Mariner Mars 1969 mission and project. Author

N71-15336*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ACTIVE SOLAR RADIO REGIONS AT METRIC FREQUENCIES AND THE INTERPLANETARY SECTOR STRUCTURES
Kunitomo Sakurai and Robert G. Stone Dec. 1970 27 p refs Submitted for publication
(NASA-TM-X-65403; X-693-70-408) Avail: NTIS CSCL 03B

The possible relation between type 1 noise active regions and the polarity distribution of the interplanetary magnetic field is examined for the period from 13 March to 21 August, 1968 (solar rotation numbers 1842-1847) by using data from ground-based and satellite observations. In general four type 1 radio regions appeared during each solar rotation period except for rotation no. 1842. The number of type 1 regions is the same as the number of sector boundaries. This result suggests that the configuration of the photospheric magnetic field extending into the interplanetary space may be related to the origin of the type 1 radio regions. The position of the source of the sector boundaries and its relation to the type 1 radio regions are investigated by taking into account the mean bulk velocity of solar winds as observed by space probes. Author

N71-15337# Michigan Univ., Ann Arbor. Inst. of Science and Technology.
ON THE VELOCITY PROFILE OF THE MOON
V. Sh. Berikashvili et al 1970 23 p refs Transl. into ENGLISH from Akad. Nauk SSSR Izv. Fiz. Zemli. (USSR), no. 7, 1965 p 9–21 Prepared by Sci. Transl. Service for Michigan Univ.
(Contract ARPA SD-78)
(AD-713725; VESIAC-13313) Avail: NTIS CSCL 3/2

The question of the distribution of the velocities of P and S waves in the depths of the moon is examined. Use is made of the results of laboratory measurements of the influence of pressure, temperature and composition on the velocity of elastic waves in

rocks, and also data on the distribution of P and S waves in the upper layers of the earth. It appeared that the moon should have an anomalously broad layer of reduced velocities. The reason for this is that the critical temperature gradient for the formation of a slow-velocity layer is proportional to the acceleration of gravity g, and on the moon this value is one-sixth as large as on earth. The question of the possibility of a disturbance of the Wiechert conditions below the lunar surface was investigated. It appeared that the probability of a disturbance of these conditions is small, although it also cannot be ruled out. Time-distance and amplitude curves were constructed for the proposed distributions of P and S waves below the lunar surface. An analogous investigation was conducted for a model of the moon with a liquid core.
Author (TAB)

N71-15338# Hawaii Univ., Honolulu. Inst. for Astronomy.
INVESTIGATION OF THE PHOTOMETRIC RESPONSE OF THE MOON AND THE PLANETS Final Report, 14 May 1968–30 Jun. 1970
William M. Sinton Jul. 1970 10 p ref
(Contract F19628-68-C-0332)
(AD-713688; AFCRL-70-0435) Avail: NTIS CSCL 3/2

An observatory consisting of a 24-inch telescope was established and operated at 13,700 feet elevation on Mauna Kea, Hawaii. The thermal radiation properties of the Moon have been studied BY AFCRL scientists. The photometric properties of Mars, Jupiter satellites, and Comet Tago-Sato-Kosaka (1969g) have been studied by University of Hawaii scientists. The atmospheric transmission to submillimeter radiation has also been investigated with a high resolution interferometer.
Author (TAB)

N71-15339# Aerospace Corp., El Segundo, Calif. Lab. Operations.
BRIGHTNESS TEMPERATURES OF THE QUIET SUN AND NEW MOON AT THE 6-mm WAVELENGTH, MAY 1969 – MARCH 1970
E. E. Reber 11 Sep. 1970 36 p refs
(Contract F04701-70-C-0059)
(AD-713114; TR-0059(6230-30)-6; SAMSO-TR-70-371) Avail: NTIS CSCL 3/2

Absolute brightness temperatures and brightness temperature ratios of a quiet region near the center of the solar disk and the central region of the new moon were measured simultaneously at the 6-mm wavelength. The measured quiet sun/new moon brightness temperature ratios and reported central brightness temperatures of the new moon confirm the measured brightness temperature of the quiet sun at the 6-mm wavelength. Reported central brightness temperatures of the new moon are tabulated and graphed as a function of frequency and wavelength. The equation of a linear regression line for the reported measurements is given for estimating the brightness temperature of the new moon at any millimeter wavelength. Estimated brightness temperatures of the new moon and measured quiet sun/new moon ratios are used to estimate solar brightness temperatures at several millimeter wavelengths. The solar brightness temperatures, the regression line, and the Van de Hulst theoretical model are presented graphically as a function of frequency and wavelength. The regression line equation is given for estimating solar brightness temperatures at any wavelength in the 6- to 1-mm wavelength interval and is solved for the wavelength of the measured ratios.
Author (TAB)

N71-15496# Louvain Univ., Belgium. Observatoire Royal de Belgique.
MERIDIAN ASTRONOMY [L'ASTRONOMIE MERIDIENNE]
Rene Dejaiffe [1970] 43 p refs In FRENCH *Its* Ciel et Terre, no. 4
Avail: NTIS

To establish a system of coordinates on which to base the celestial sphere, two problems are involved: determining the coordinates of star series and determining the fundamental astronomical constants. A brief description of meridian instruments and their principle uses in astronomy is given. Tests are conducted to give the exact location that reveals the constitution of star catalogues.
Transl. by E.H.W.

N71-15603# Royal Greenwich Observatory, Herstmonceux (England).
OBSERVATIONS OF STELLAR PARALLAX. VOLUME 3: FROM PHOTOGRAPHS TAKEN AT THE ROYAL OBSERVATORY, GREENWICH, IN THE YEARS 1924 – 1939
1970 148 p refs
Avail: NTIS

The program for the determination of stellar parallaxes at Greenwich was commenced in 1913 and continued until the outbreak of war in 1939. The instrument employed was the Thompson 26 inch photographic refractor of 22 feet 6 inches focal length, giving a plate scale of approximately 30 seconds of arc per millimeter. The first volume of observations of stellar parallax, covering the period 1913-1924 and containng the parallaxes of 266 stars, was published in 1925; the second volume, published in 1934, contained 250 stars, nearly all in the Greenwich Astrographic Zone. The present volume is the third in the series and contains 261 stars, thus bringing to 771 the number of stars for which sufficient material was obtained at Greenwich to enable parallaxes to be determined.
Author

N71-15677# Joint Publications Research Service, Washington, D.C.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 241
27 Nov. 1970 53 p refs Transl. into ENGLISH from various Sino-Soviet publications
(JPRS-51856) Avail: NTIS

CONTENTS:

1. ASTRONOMY p 1–7 refs (See N71-15678 05-30)
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4. TERRESTRIAL GEOPHYSICS p 26–32 refs (See N71-15681 05-13)
5. UPPER ATMOSPHERE AND SPACE RESEARCH p 33–47 refs (See N71-15682 05-13)
6. MISCELLANEOUS: POLAR REGION RESEARCH p 48–49 refs (See N71-15683 05-13)

N71-15678# Joint Publications Research Service, Washington, D.C.
ASTRONOMY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 241 27 Nov. 1970 p 1–7 refs (See N71-15677 05-30)
Avail: NTIS

The results of a two year expedition of astronomers are briefly reviewed, including site selection for an observatory in the Sanglok Mountain complex. A total eclipse of the sun was observed from Cuba and Mexico on 7 March 1970. A state-of-the-art review on radio astronomy in the millimeter and submillimeter ranges is presented, along with operational reports on a broadband radio telescope, UTR-2. Abstracts on various astronomical literature are also included.
J.A.M.

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

N71-14504*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Space Sciences Div.

OBSERVATIONAL PATROL OF MARS IN SUPPORT OF MARINERS 6 AND 7

C. F. Capen 15 Jun. 1970 18 p refs

(Contract NAS7-100)

(NASA-CR-115849; JPL-TR-32-1492) Avail: NTIS CSCL 22A

A summary of the physical appearance of Mars during the 1969 apparition is presented for use in planetary research and in support of the Mariner 6 and 7 missions. An account is given of the seasonal meteorological activity and surface conditions before and during the Mariner encounters. Diameter measurements of the regressing south polar cap are tabulated. For comparison with Mariner pictures, a current Regional Mars Map 1969 of longitudes 240 to 100, inclusive, was prepared from high-resolution observations (0.1 to 0.2 arc seconds) acquired during late Martian summer. Author

N71-14511*# Houston Univ., Tex.

CONCEPTUAL DESIGN OF A MANNED-UNMANNED LUNAR EXPLORER (MULE)

John C. Lindholm (Kansas State Univ.), Raymond F. Neathery (Le Tourneau Coll.), and John R. Howell, eds. Sep. 1970 552 p refs Sponsored in part by NASA Prepared in cooperation with Rice Univ., Houston

(Grant NGT-44-005-114)

(NASA-CR-115822) Avail: NTIS CSCL 22C

The methods used to establish the requirements for the mobility aid, the methods used to synthesize the aid, and the resulting mobility system are discussed. The MULE has a gross terrestrial weight of 9705 pounds. It has a mission capability of 36 hours, 250 km in the manned mode, and 1500 km in the unmanned mode. It employs a two-man crew, uses tracks for locomotion, and transports a science payload of 2000 pounds. N.E.N.

N71-14512# Aerospace Corp., El Segundo, Calif. Systems Engineering Operations.

PROBABILITY OF RESCUE SUCCESS OF EMERGENCY RETURN OF SPACECRAFT Technical Report, Jan.–Aug. 1969

S. T. Chu and A. R. Nagy, Jr. 15 Aug. 1970 107 p refs

(Contract F04701-70-C-0059)

(AD-713106; TR-0059(6758-06)-1; SAMSO-TR-70-373) Avail: NTIS CSCL 22/3

The problem of successful emergency return of spacecraft or escape capsule from low earth orbit is investigated by combining the orbital waiting characteristics of the spacecraft and the capabilities of surface recovery forces. The analysis of return probability of spacecraft to multiple recovery areas, including the factors of local time constraints and redundant access, is summarized. The probability of successful rescue is developed by matching of two independents: the return from orbit by the spacecraft and the search and rescue by aircraft. Two retrieval methods are considered: water pickup and air snatch. The method of analysis and information presented have broad applicability in program planning and conceptual studies of future manned space systems. Sample results of typical applications are included. Author (TAB)

N71-14597*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE ATS-F/NIMBUS-E TRACKING AND DATA RELAY EXPERIMENT

R. H. Pickard and P. J. Heffernan Oct. 1970 14 p refs Presented at the 7th Ann. AIAA Meeting and Tech. Display, Houston, Tex., Oct. 1970

(NASA-TM-X-65400; X-751-70-361) Avail: NTIS CSCL 22A

The tracking and data relay experiment is a major step in the development of technology for an operational system of Tracking and Data Relay Satellites (TDRS). The experiment will provide data on real-time command and telemetry relay and long-arc range and range-rate tracking of a low altitude satellite through a synchronous relay satellite. The basic concept is to equip the ATS-F spacecraft to function as a high performance S-band command, data acquisition, and range and range-rate tracking station in equatorial synchronous orbit. The 30 foot diameter ATS-F parabolic reflector will be programmed for open-loop pointing at the Nimbus-E spacecraft as the latter moves across the face of the earth in its 600 nautical mile polar orbit. Nimbus-E will carry a range and range-rate transponder of standard design, modified to provide additional transmit power, and augmented with a steerable antenna of medium directivity. Author

N71-14662# Joint Publications Research Service, Washington, D.C.

SUPPLEMENT: 'SOYUZ' COMMAND MODULE

In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 240 10 Nov. 1970 p 45–51 (See N71-14656 05-30)

Avail: NTIS

A transcript of an interview with the cosmonaut V. A. Shatalov is presented. Command module configuration and instrumentation is discussed along with flight crew operational responsibilities within the module and when performing extravehicular tasks. A photograph of a command module instrument control panel is included. E.C.

N71-15002*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

PREDICTED LAUNCH CHARACTERISTICS OF THE HL-10 MANNED LIFTING ENTRY VEHICLE LAUNCHED FROM THE B-52 AIRPLANE

Linwood W. McKinney and Richmond P. Boyden Washington Nov. 1968 81 p refs

(NASA-TM-X-1668) Avail: NTIS CSCL 01A

An investigation has been made to assess the effects of the aerodynamic interference of the B-52 flow field on the launch characteristics of both subsonic and transonic HL-10 manned lifting entry vehicle configurations using six-degrees-of-freedom motion calculations. The static aerodynamic data used as inputs in the investigation were obtained from high speed wind tunnel tests. The computed launch characteristics for all launch conditions indicate safe launch conditions. Author

N71-15004*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.

INVESTIGATION OF THE CONTROLLABILITY OF THE M2-F2 LIFTING-BODY LAUNCH FROM THE B-52 CARRIER AIRPLANE

Berwin M. Kock and Weneth D. Painter Washington Dec. 1968 33 p refs

(NASA-TM-X-1713) Avail: NTIS CSCL 22 A

The launch characteristics of the M2-F2 lifting body after release from the B-52 carrier aircraft were studied using analytical methods and simulators to predict launch safety and to determine the piloting requirements during launch. The predicted launch characteristics and the flight results are compared. Author

N71-15138*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Engineering Mechanics Div.

ATTITUDE CONTROL AND STRUCTURAL RESPONSE INTERACTION

Jacob Abel 15 Nov. 1970 15 p

(Contract NAS7-100)

(NASA-CR-111528; JPL-TR-32-1461) Avail: NTIS CSCL 22B

The problem of the interaction between the structural or elastic response of a spacecraft and the attitude control system

dynamics is considered. A general discussion of the possible modes of interaction provides a means of classifying a given spacecraft with respect to the interaction problem. A model spacecraft system is studied and some parameters characterizing the interactions are identified. The question of system stability in the mathematical sense is discussed and the idea of a definition of a practical stability criterion is presented. This concept is applied to the model spacecraft system. Some comments on the adequacy of present methods of evaluating the significance of interactions between attitude control systems and structures are given with particular regard to the concept of frequency separation. Author

N71-15159*# General Electric Co., Philadelphia, Pa. Valley Forge Space Center.
MATE: USER'S MANUAL. STUDY SIMULATION OF SPACE STATION DYNAMICS Final Report
M. J. Gaitens 26 Oct. 1970 226 p
(Contract NAS8-25710)
(NASA-CR-102971; Doc-705D5478) Avail: NTIS CSCL 22B

The necessary information for use of the MATE digital computing system is provided. MATE is an acronym for Matrix Algebra Translator and Executor. It is a digital computing system that gives a rapid and direct means of presenting any problem formulated in terms of matrix, vector and/or scalar arithmetic to the computer for numerical evaluation. Included in this report are complete coding instructions for use by the analyst in solving problems. This includes input data procedures; coding matrix, vector and scalar expressions and statements; available logical operations, expressions and statements; control statements; and procedures for coding MATE statements and routines. Sample problems are included to demonstrate the operation of the MATE system. Author

N71-15160# Communications Research Centre, Ottawa (Ontario). National Space Telecommunications Lab.
BOOM DEFLECTION DURING STEADY STATE ORBIT EXPANSION OF AN ISIS-TYPE SATELLITE
T. W. Garrett Jul. 1970 9 p refs
(CRC-TN-632) Avail: NTIS

Investigated is the effect of orbit expansion thrust on the safety of the 615 foot long sounder antennas proposed for an ISIS-type satellite. small deflection theory differential equation for the shape of a beam subjected to centrifugal straightening forces and orbit expansion thrust is solved numerically using the finite difference technique. A maximum thrust level of 0.06 lb is recommended for the proposed configuration spinning at 0.005 rad/sec. Author

N71-15161# BAI Corp., Glenbrook, Conn.
ANALYSIS OF POLARIZATION EFFECTS IN THE SIRS B SATELLITE SPECTROMETER Final Report
M. G. Dreyfus 1970 25 p refs Sponsored by ESSA
(PB-192130; BAI-691017) Avail: NTIS CSCL 20F

It is shown that there are probably substantial variations in SIRS B grating efficiency due to polarization effects in or near several bandpasses between 13 micrometers and 19 micrometers. These variations in grating efficiency do not explain the calibration errors noted; however, it is shown that they can cause another calibration error that changes significantly with time in orbit due to outgassing to and from the grating surface. Polarization effects due to the angular position of the SIRS B earth's scanning mirror are discussed. A simplified approximate theory of infrared metallic polarization is derived for use in analyzing SIRS B polarization effects. USGRDR

N71-15316*# Astro Research Corp., Santa Barbara, Calif.
ANALYSIS OF PLANETARY FLYBY USING THE HELIOGYRO SOLAR SAILER
John M. Hedgepath and Max D. Benton 9 Aug. 1968 23 p refs
(Contract NAS7-427)
(NASA-CR-115852; ARC-R-296) Avail: NTIS CSCL 22A

Mission analyses are made for the application of the Heliogyro solar sailer concept to planetary flyby with particular emphasis on Jupiter. The analysis takes into account the relationship between payload mass fraction and vehicle lightness number, performance characteristics for two launch vehicles, and the elementary planar equations of motion. Flight times are determined and optimized for various assumed sail-lightness numbers and for the two launch vehicles. Results show that 400 kg of payload can be placed in the vicinity of Jupiter in 470 days with a Titan 3 C-Burner 2 launch vehicle if a reasonable extension in polymer-film-fabrication state of the art is assumed. The same solar sailing mission can be done in 800 days with an Atlas SLV3C-Centaur launch vehicle. Author

N71-15317*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APOLLO 14 (AS-509) OPERATIONAL TRAJECTORY FOR 31 JANUARY 1971, LAUNCH WINDOW
Gerald Wittenstein, Dewey C. Bell, Jerry D. Weller, and C. L. Varnado 11 Dec. 1970 559 p refs
(NASA-TM-X-66565) Avail: NTIS HC $10.00/MF $0.65 CSCL 22A

The predicted launch vehicle operational trajectory and accompanying data for the Apollo 14, AS-509 mission are presented. All data presented are for a January 31, 1971 launch window. Detailed trajectory printout is provided for only the prime azimuth of 72.0869 deg corresponding to a launch time of 20:23 GMT (15:23 EST). However, pertinent summary data are presented for other azimuths in the window. Trajectory data are presented for all phases of flight through spacecraft separation, including data pertaining to the impact of the spent stages. A brief discussion of the flight sequence is presented in addition to a critical event sequence table for the prime azimuth. Launch vehicle guidance and targeting presettings are included as well as predicted performance and mass characteristics. Author

N71-15318*# Teledyne Brown Engineering, Huntsville, Ala. Science and Engineering Div.
CONCEPTUAL DESIGN OF A SPACECRAFT FOR THE HIGH ENERGY ASTRONOMY OBSERVATORY (HEAO) MISSION C Summary Report
J. M. Duffie, ed. Nov. 1970 542 p refs
(Contract NAS8-26003)
(NASA-CR-102982; SE-MSFC-1257) Avail: NTIS CSCL 22B

A conceptual design is presented for the High Energy Astronomy Observatory Mission C spacecraft and its major systems, including structural, attitude sensing, attitude control, thermal control, electrical power, communications, and data handling. The spacecraft and system requirements are based upon a candidate list of experiments consisting primarily of two grazing incidence X-ray telescopes and their associated detectors. Both the mirrors and detectors are mounted to an optical bench which is contained within the spacecraft and which must be controlled thermally within narrow limits. The mission duration is one to two years in a 300-nautical mile, circular, 35-degree inclination, earth orbit. Attitude control is provided by control moment gyros (CMG). Momentum saturation of the CMG is prevented by the use of magnetic torquers which react with the geomagnetic field to produce desaturating torques on the spacecraft. Thermal control of the optical bench is achieved by insulating the bench from the spacecraft and choosing a thermal filter of proper design which both prevents unwanted solar heat from entering the telescope and also controls the heat emitted from the telescope to space. Spacecraft ground contact will be limited to data dumps, clock updates, and relatively infrequent ground control commands. Both STADAN and MSFN ground stations will be used. Author

N71-15349*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Space Systems Div.
LUNAR MISSION SAFETY AND RESCUE Midterm Presentation, Nov. 1970
R. F. Hausman, W. K. Carter, and J. E. Piper Nv. 1970 242 p
(Contract NAS9-10969)
(NASA-CR-114801; MA-138T-1) Avail: NTIS CSCL 22A

The study is divided into two major and two minor tasks: (1) definition of a representative advanced lunar program exercising all reasonable elements of advanced lunar missions that could result in hazards to man. Lunar integrated program plan models, project definition documents, and studies of IPP elements are used as a basis; (2) hazards analyses leading to safety requirements and recommendations, rescue mission requirements, and safety technology development recommendations; (3) escape/rescue analysis leading to escape/rescue concepts and a lunar mission rescue plan; (4) documentation and briefings presenting the program and results of the study. Author

N71-15351*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE UTILIZATION OF HALO ORBITS IN ADVANCED LUNAR OPERATIONS
Robert W. Farquhar Dec. 1970 108 p refs
(NASA-TM-X-65409; X-551-70-449) Avail: NTIS CSCL 22A

Flight mechanics and control problems associated with the stationing of spacecraft in halo orbits about the translunar libration point are discussed. Procedures for control techniques are described, which can be carried out with very small Delta V costs. The possibility of using a relay satellite in a halo orbit to obtain a continuous communications link between the earth and the far side of the moon is also discussed. Advantages of this type of lunar far-side data link over conventional relay-satellite systems are cited. It is shown that, with a halo relay satellite, it would be possible to continuously control an unmanned lunar roving vehicle on the Moon's far side. Backside tracking of lunar orbiters could also be realized. The desirability of locating a lunar space station in a halo orbit instead of a lunar polar orbit is investigated. It is found that the halo orbit location is superior in almost every respect. The performance of a reusable lunar shuttle transportation system using halo-orbit rendezvous is better than one using lunar-orbit rendezvous. Author

N71-15377*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LINEAR REPEATER DESIGN FOR THE GSFC MARK 1 TRACKING AND DATA RELAY SATELLITE
Paul J. Heffernan Oct. 1970 10 p refs Presented at the UMR-Mervin J. Kelly Commun. Conf., Rolla, Mo., 5–7 Oct. 1970
(NASA-TM-X-65408; X-751-70-445) Avail: NTIS CSCL 22B

A single aspect of the general TDRS telecommunications design problem is discussed, namely use of synchronous relay satellites to collect low data rate telemetry from multiple small unstabilized spacecraft and transmit the multiple signals to a central ground data processing facility. The proposed approach is to configure the TDRS as a two-channel linear frequency translation repeater with each channel sensitive to one of two orthogonal linear signal polarizations, thus permitting optimal polarization diversity reception on a per user basis. Classical load rating theory is used to size repeater gain and dynamic range requirements for linear operations in the presence of an anticipated worst-case RFI environment. A sample design based on user/TDRS signaling in the existing VHF telemetry band suggests that the two-channel linear repeater approach can be implemented with acceptable penalties in spacecraft weight and prime power relative to alternate approaches such as hard-limiting repeaters. Author

N71-15484*# Jet Propulsion Lab., Calif Inst. of Tech., Pasadena.
MARINER MARS 1969. VOLUME 1: DEVELOPMENT, DESIGN, AND TEST Final Project Report
J. H. Wilson, comp. 1 Nov. 1970 622 p refs
(Contract NAS7-100)
(NASA-CR-115875; JPL-TR-32-1460) Avail: NTIS CSCL 22B

This volume covers the preparation and preflight phase for the dual spacecraft mission, Mariner 6 and Mariner 7, from December 1965 through March 1969. Discussed in detail are: (1) project management, planning, and mission analysis; (2) development, design, and testing of spacecraft system and subsystems; and (3) launch and earth-based systems. A.L.

N71-15486*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LOW-SUBSONIC AERODYNAMIC CHARACTERISTICS OF A SPACE SHUTTLE-ORBITER CONCEPT WITH A BLENDED DELTA WING-BODY
Delma C. Freeman, Jr. Washington Jan. 1971 26 p refs
(NASA-TM-X-2209; L-7561) Avail: NTIS CSCL 22B

An investigation has been conducted in the Langley low turbulence pressure tunnel to determine the longitudinal and lateral directional aerodynamic characteristics of an orbiter model at low subsonic speeds. The configuration was a blended wing-body with a delta planform and was representative of a proposed high cross range space shuttle-orbiter. The model had a leading edge sweep of 67.5 deg and tip fins having 5 deg toe-in and 15 deg roll-out. The model was tested over a range of Reynolds number, based on body length, from about 5.11 million to 30.59 million, at Mach numbers less than 0.35, and at angles of attack from about −4 deg to +20 deg. Author

N71-15566* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
ELECTRONIC CHECKOUT SYSTEM FOR SPACE VEHICLES Patent
Gary J. Woods, Walter E. Parsons, Harold G. Johnson, George M. Preston, Thomas S. Walton et al, inventors (to NASA) Issued 20 Oct. 1970 (Filed 7 Nov. 1969) 22 p Cl. 340-172.5; Int. Cl. G05f23/02 Continuation-in-part of US Patent Appl. SN-621746, filed 7 Mar. 1967
(NASA-Case-XKS-08012-2; US-Patent-3,535,683; US-Patent-Appl-SN-874958) Avail: US Patent Office CSCL 22B

A system for testing a space vehicle thoroughly, accurately, and with a minimum of engineering personnel is described. It checks out thousands of functional elements by utilizing digital computer systems. These computer systems automatically send and monitor routine, repetitive, and prelaunch commands. Official Gazette of the U.S. Patent Office

N71-15624*# Sandia Corp., Albuquerque, N.Mex.
ANALYSIS OF OPTIMAL SELECTION OF NOSE CONES FROM BILLETS AND USE OF THE COMPUTER PROGRAM CONE
R. D. Halbgewachs Sep. 1970 104 p Sponsored by AEC
(SC-RR-70-586) Avail: NTIS

It is highly desirable to be able to select, from billets of material, nose cones that contain as few material imperfections as possible. Utilizing test data in the form of ultrasonic reflections, a mathematical model was developed which describes: (1) optimization factors for comparing one cone to another, (2) weighting functions which take into consideration measurement inaccuracies in the test data and related pseudo-diameters of imperfections, (3) relative locations of the imperfections in the billet and selected cone, and (4) clustering and crack potentials of imperfections. A computer program, CONE, was written to perform the calculations necessary for the optimized selection of these nose cones. Author

N71-15637* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AUTOMATICALLY DEPLOYING NOZZLE EXIT CONE EXTENSION Patent

Donald R. Ward, inventor (to NASA) Issued 6 Sep. 1966 (Filed 20 Jul. 1965) 5 p Cl. 60-35.6

(NASA-Case-XLE-10640; US-Patent-3,270,504;
US-Patent-Appl-SN-473535) Avail: US Patent Office CSCL 22B

An exit cone assembly comprising an exit rocket nozzle for a combustion chamber of a rocket and an extension for the nozzle that can be automatically deployed to an extended position when the prior stage falls away from the rocket is described. The extension of the nozzle increases the exit cone area ratio of the rocket nozzle which results in an increased specific impulse and heavier mission payloads. Official Gazette of the U.S. Patent Office

N71-15643* McDonnell-Douglas Co., Santa Monica, Calif.

ROCKET NOZZLE TEST METHOD Patent

Ellis G. Estes, inventor (to NASA) Issued 20 Oct. 1970 (Filed 30 Apr. 1968) 5 p Cl. 73-116; Int. Cl. G01m15/00 Sponsored by NASA

(NASA-Case-NPO-10311; US-Patent-3,534,597;
US-Patent-Appl-SN-725475) Avail: US Patent Office CSCL 21H

A method is described for testing a rocket nozzle, having a throat submerged in the engine chamber, at high tensile stress levels. The method comprises briefly operating the rocket engine at higher than usual mass flow rates, until inner and outer portions of the throat walls reach a maximum temperature difference. At this time, the mass flow rate is suddenly lowered. When the mass flow rate is cut, the pressure drops rapidly while the temperature differential decreases only slowly. For a period after the mass flow rate is cut, the thermally induced tensile stresses are only slightly counteracted by the pressure induced compressive stresses, so that a high net tensile stress level is obtained. Official Gazette of the U.S. Patent Office

N71-15647* North American Aviation, Inc., El Segundo, Calif.

AERODYNAMIC SPIKE NOZZLE Patent

Thomas E. Cowell and Ira B. Madison, inventor (to NASA) Issued 6 Sep. 1966 (Filed 5 Mar. 1964) 6 p Cl. 60-35.6 Sponsored by NASA

(NASA-Case-XGS-01143; US-Patent-3,270,501;
US-Patent-Appl-SN-349781) Avail: US Patent Office CSCL 22B

A method is described for constructing a nozzle that forms a spike from a fluid rather than from physical hardware. The nozzle is made with a central or inner injector that ejects a propulsion stream at a subsonic velocity, and an outer circumscribed annular injector that ejects a propulsion stream at a supersonic velocity adjacent to the subsonic propulsion stream. The supersonic propulsion stream expands on leaving the nozzle and shapes the subsonic propulsion stream into a conical spike. The use of a fluid spike eliminates the high temperature and heat transfer problems inherent in a physical spike. R.B.

N71-15663* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

ALLEVIATION OF DIVERGENCE DURING ROCKET LAUNCH Patent

Warren Gillespie, Jr., inventor (to NASA) Issued 26 Jul. 1966 (Filed 26 Dec. 1963) 10 p Cl. 244-1

(NASA-Case-XLA-00256; US-Patent-3,262,655;
US-Patent-Appl-SN-333766) Avail: US Patent Office CSCL 22D

The solution of a servo-aeroelastic problem by introducing linkages between a rocket and the booster engine is presented. The invention provides a linkage that permits one section of an aerodynamic body to be essentially free floating and to trim into the relative wind of its own accord so as to reduce stabilizing control moments required of gimballed rocket motors or booster fins. NASA

N71-15664* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SPACE CAPSULE Patent

Maxime A. Faget, Andre J. Meyer, Jr., Robert G. Chilton, Willard S. Blanchard, Jr., Alan B. Kehlet, inventors (to NASA), et al Issued 6 Sep. 1966 (Filed 13 Dec. 1962) 7 p Cl. 220-1* Continuation-in-part of US Patent Appl. SN-847023, filed 16 Oct. 1959

(NASA-Case-XLA-01332; US-Patent-2,270,908;
US-Patent-Appl-SN-250974) Avail: US Patent Office CSCL 22B

The design and configuration of a manned space capsule is discussed. The proposed spacecraft contains improved micrometeorite, heat, and load sustaining structures, and possesses a high degree of aerodynamic stability and structural integrity during launching, orbiting, and reentry phases of the flight trajectory. The unique features of the proposed capsule rest in the types of structural members which provide increased strength and heat resistance. P.N.F.

N71-15674* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

VARIABLE GEOMETRY MANNED ORBITAL VEHICLE Patent

Bernard Spencer, Jr. and Beverly Z. Henry, inventors (to NASA) Issued 20 Oct. 1970 (Filed 7 Sep. 1967) 7 p Cl. 244-1; Int. Cl. B64c25/00, 31/00, 37/00

(NASA-Case-XLA-03691; US-Patent-3,534,924;
US-Patent-Appl-SN-667825) Avail: US Patent Office CSCL 22B

A reusable lifting vehicle capable of high aerodynamic efficiency over the speed range from hypersonic reentry to low speed tangential landing is described. This high aerodynamic efficiency is achieved by the use of a variable geometry vehicle configuration in which auxiliary, pivotal wings are incorporated. At hypersonic speeds the auxiliary wings fold into a stored position, and at lower speeds the wings are deployed at sweep angles decreasing from 90 deg to 0 deg as speed decreases. Improvements in lift, lift-drag ratio, and in the stability of the vehicle are also provided. Detailed descriptions accompany drawings. Official Gazette of U.S. Patent Office

N71-15675* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SPACE CAPSULE EJECTION ASSEMBLY Patent

Alfred P. Warren and Billy D. Lawson, inventor (to NASA) Issued 26 Jul. 1966 (Filed 15 Jun. 1964) 6 p Cl. 89-1.5 Continuation-in-part of US Patent Appl. SN-221945, filed 24 Nov. 1964

(NASA-Case-XMF-03169; US-Patent-3,262,365;
US-Patent-Appl-SN-376405) Avail: US Patent Office CSCL 22B

An assembly for opening the stabilizing and decelerating flaps of flight capsules used in space research is described. The assembly comprises an area for storing the capsule prior to recovery, an ejector device for ejecting the capsule from the storage area, a group of detechable stabilizing and decelerating flaps, and a device for automatically opening and locking the stabilizing and decelerating flaps. R.B.

N71-15676* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

CARTWHEEL SATELLITE SYNCHRONIZATION SYSTEM Patent

James A. Gatlin, inventor (to NASA) Issued 20 Oct. 1970 (Filed 9 Apr. 1968) 8 p Cl. 244-1; Int. Cl. B64g1/00

(NASA-Case-XGS-05579; US-Patent-3,534,925;
US-Patent-Appl-SN-719869) Avail: US Patent Office CSCL 22B

A method and apparatus are described for the spin phase synchronization of a cartwheel satellite in a polar orbit. The method

comprises: sensing the spin rate of the satellite, comparing the rate with a reference rate, and making adjustments, if necessary. An additional step of commutating a torquing coil is also provided. The apparatus includes a sensor means located on the satellite for sensing the spin rate and generating a signal relative to the rate. A comparison means compares the spin rate signal with the reference signal and generates an error signal related to the phase difference between the two spin rate signals. The error signal is used to control the application of energy to a torquing coil mounted on the satellite. The energy is also commutated by a programmer in accordance with the satellite attitude and polar orbit position before application of the torquing coils.
Official Gazette of the U.S. Patent Office

N71-15687* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PAYLOAD/BURNED-OUT MOTOR CASE SEPARATION SYSTEM Patent
Nathan D. Watson inventor (to NASA) Issued 20 Oct. 1970 (Filed 4 Oct. 1968) 6 p Cl. 102-49.5; Int. Cl. F02k9/06
(NASA-Case-XLA-05369; US-Patent-3,534,686; US-Patent-Appl-SN-765123) Avail: US Patent Office CSCL 22C

A payload separation system is described which utilizes a Marmon band clamp to separate a spent motor case from the payload. A retrorocket fixed to the motor case is fired to cant the motor case. Another retrorocket, opposite the first, is ignited while the first one is still burning, and together they move the spent motor case out of the path of the payload.
Official Gazette of the U. S. Patent Office

N71-15689* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AIR CUSHION LIFT PAD Patent
Dan H. Dane and Herman T. Blaise, inventors (to NASA) Issued 20 Oct. 1970 (Filed 15 Aug. 1968) 5 p Cl. 180-118; Cl. 180-121; Int Cl. B60v1/06
(NASA-Case-MFS-14685; US-Patent-3,534,826;
US-Patent-Appl-SN-752947) Avail: US Patent Office CSCL 22B

A platform having several ground effect pads is supported in a substantially frictionless manner over a surface. Each pad has a plenum chamber with an open bottom which enables pressurized air to support the pad above the surface. The load of the platform is applied to the top center of each pad. The upper wall of the pad converges downwardly from the side wall of the plenum chamber so that the center of lift of the resultant pressure is above the point of application of the load.
Official Gazette of the U.S. Patent Office

N71-15692* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VELOCITY PACKAGE Patent
John W. Wilkey, Jr., inventor (to NASA) Issued 12 Jul. 1966 (Filed 8 Jun. 1964) 31 p Cl. 102-49
(NASA-Case-XLA-01339; US-Patent-3,260,204;
US-Patent-Appl-SN-373591) Avail: US Patent Office CSCL 22B

A velocity package is described that works in combination with launch vehicle payload velocities from 37,000 to 44,000 feet per second and is capable to provide spin stabilization with high trajectory error minimization and high mass ratio effects. The package includes an adapter for mating the remainder to the sustainer stage of the launch vehicle after an initial velocity of about 18,000 feet is obtained, the trajector of the velocity package is fixed, and the package is separated from the launch vehicle. The guidance system of the spacecraft operates to place the payload containing velocity package on the proper trajectory and thereafter, only a simply gyro controlled jet reaction system maintains its course. Cold separation and spin stabilization functions of the velocity package are performed in such a manner that there is a minimum tipoff of the reentry package and its payload. G.G.

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N71-14537# Douglas Aircraft Co., Inc., Long Beach, Calif.
FORMAT-FORTRAN MATRIX ABSTRACTION TECHNIQUE. VOLUME 7, SUPPLEMENT 1: DESCRIPTION OF DIGITAL COMPUTER PROGRAM, PHASE 3, EXTENDED Final Report, 1 Jul. 1968 – 30 Apr. 1970
J. A. Frank Wright-Patterson AFB, Ohio AFFDL Aug. 1970 39 p refs
(Contract F33615-68-C-1633)
(AD-713840; DAC-33569-Vol-7-Suppl-1;
AFFDL-TR-66-207-Vol-7-Suppl-1) Avail: NTIS CSCL 20/11

The format System has been updated by the incorporation of additional basic capability and the refinement of existing capability. A simpler mode of updating case data and extended force method matrix generation capability has been incorporated in Phase I of the system. A refined "Structure Cutter' module, capabilities for matrix partitioning and instruction looping, and an additional eigenvalue/eigenvector extraction module have been incorporated in Phase II. Finally the Limitations which existed in the matrix plotting capability in Phase III have been eliminated. Programming documentation for the extended capability of Phase III of the format System is presented in this report. For Vol. 7, see N69-27350.
Author (TAB)

N71-14538# Douglas Aircraft Co., Inc., Long Beach, Calif.
FORMAT-FORTRAN MATRIX ABSTRACTION TECHNIQUE. VOLUME 5, SUPPLEMENT 1: ENGINEERING USER AND TECHNICAL REPORT EXTENDED Final Report, 1 Jul. 1968 – 30 Apr. 1970
J. Pickard Wright-Patterson AFB, Ohio AFFDL Aug. 1970 75 p refs
(Contract F33615-68-C-1633)
(AD-713727; DAC-33569-Vol-5-Suppl-1-
AFFDL-TR-66-207-Vol-5-Suppl-1) Avail: NTIS CSCL 20/11

The format System has been updated by the incorporation of additional basic capability and the refinement of existing capability. A simpler mode of updating case data and extended force method matrix generation capability has been incorporated in Phase I of the system. A refined 'Structure Cutter- module, capabilities for matrix partitioning and instruction looping, and an additional eigenvalue/eigenvector extraction module have been incorporated in Phase II. Finally the limitations which existed in the matrix plotting capability in Phase III have been eliminated. Engineering user and technical information is presented in this report. Included are recommendations of improvements in implementation and utilization procedures for various computer systems. For Vol. 5, see N69-30385.
Author (TAB)

N71-14556# Watervliet Arsenal, N.Y.
STRAIGHT CRESTED WAVES IN AN INFINITE LINEAR VISCOELASTIC PLATE USING THE STANDARD LINEAR SOLID MODEL AND ASSUMING CONSTANT POISSON'S RATIO
Struan Robertson Oct. 1970 32 p refs
(AD-713301; WVT-7052) Avail: NTIS CSCL 20/11

The problem of straight crested waves propagating in an infinite plate composed of a linear viscoelastic material is examined. It is found that, for the assumption of constant Poissons ratio, the roots obtained for Rayleighs characteristic equation for the infinite elastic plate can be used to determine the damping and frequency

of oscillation in the viscoelastic case. The standard linear solid is used to represent the materials behavior in shear. A particular example is given for polyisobutylene. Author (TAB)

N71-14598# Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
A FINITE ELEMENT STRESS ANALYSIS OF A CRACK IN A BI-MATERIAL PLATE
R. K. Leverenz Jun. 1970 63 p refs
(Contract N00019-69-C-0289)
(AD-713593; T/AM-331) Avail: NTIS CSCL 20/11

A stress analysis is obtained for the problem of a crack in one material of a bi-material plate located perpendicular to the material interface. A numerical solution is obtained using finite element techniques to obtain the force displacement relationships. Knowing this, a work integral method is used to determine the stress intensity factors for the crack. Since the work integral is independent of path, the path of integration can be chosen far enough away from the crack tip to avoid the complications of the crack tip singularity. The problem is studied for a number of cases where the crack length to plate width ratio, distance from crack tip to material interface, and the ratio of material constants were varied as parameters. Author (TAB)

N71-14618# Research Inst. of National Defence, Stockholm (Sweden).
RAM ENGINE WITH INTEGRATED STARTING STAGE RRX1 (KRP4). THEORETICAL CALCULATION OF CHANGES IN DIMENSIONS OF THE SOLID FUEL CHARGE WITH HARDENING AND COOLING IN STEEL AND DURESTOS CASING RESPECTIVELY [RAMMOTOR MED INTEGRERAT STARTSTEG RRX1 (KRP4). TEORETISK BERAEKNING AV DIMENSIONS-AENDRINGAR HOS KRUTLADDNINGEN VID HAERDNING OCH AVKYLNING I STALRESPEKTIVE DURESTOSHYLSA]
Bert Andersson and Arnold Magnusson Aug. 1969 9 p In SWEDISH
(FOA-2-C-2337-46) Avail: NTIS

In the manufacture of solid fuel charges for RRX1 it has been difficult to withdraw the core after the completion of hardening. Analysis of the changes in the shape of the charge by means of the finite element program shows that the reason could be the low form stability of the mold/engine insulation made for Durestos. The measures taken have eliminated the problem. Author

N71-14724# Pisa Univ. (Italy). Inst. of Applied Mechanics and Machine Construction.
ON THE OSCILLATIONS OF A DISK FIXED TO A FLAT PLATE: EFFECT OF AN INTERPOSED FLUID [SULLE OSCILLAZIONI DI UN DISCO AFFACCIATO AD UNA LASTRA PIANA: EFFETTO DEL FLUIDO INTERPOSTO]
Constantino Carmignani and Enrico Manfredi 1969 17 p refs In ITALIAN
(Publ-3; Rept-1268) Avail: NTIS

A simple theory is proposed for treating the phenomenon of an immersed disk oscillating with the fluid interposed between the disk and a flat plate to which the disk is attached. The experimental apparatus is described, and the results of the experiments are presented. The results show that the inertia of the interposed fluid between the disk and the fixed plate has a significant effect on the frequency of the oscillations. Transl. by F.O.S.

N71-14780# Pisa Univ. (Italy). Inst. of Applied Mechanics and Machine Construction.
SLOW FATIGUE WITH BIAXIAL STRESS [FATICA LENTA CON STATO DI SOLLECITAZIONE BIASSIALE]
Guiseppe Forasassi 1969 103 p refs In ITALIAN
(Publ-1267; Rept-1) Avail: NTIS

The results and conclusions of research on fatigue with failure in materials subjected to a few cycles of biaxial stress are presented. The factors which influence the resistance of materials subjected to this type strain are examined. Formulas and experimental results are used to determine the risks for fatigue failure of various steels in pressure vessels. Transl. by F.O.S.

N71-14793# Sandia Corp., Albuquerque, N.Mex.
COMPATIBILITY OF EXPLOSIVES WITH STRUCTURAL MATERIALS OF INTEREST
R. J. Buxton and T. M. Massis Aug. 1970 48 p refs Sponsored by AEC
(SC-M-70-355) Avail: NTIS

The compatibility of explosives with various structural materials is discussed. The explosives include primary and secondary explosives, propellants, and pyrotechnic materials. The structural materials considered are metals, plastics, and adhesives. A quick reference for the use of engineers is provided. Author

N71-15003*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
VENTRICAL-TAIL LOADS AND CONTROL-SURFACE HINGE-MOMENT MEASUREMENTS ON THE M2-F2 LIFTING BODY DURING INITIAL SUBSONIC FLIGHT TESTS
Jerald M. Jenkins, Ming H. Tang, and George P. E. Pearson Washington Dec. 1968 24 p refs
(NASA-TM-X-1712) Avail: NTIS CSCL 01A

Subsonic aerodynamic load characteristics are presented for the right vertical tail and the control surfaces of the M2-F2 lifting body vehicle. The effects of vehicle attitude and control surface deflection on the vertical tail loads are determined. Coefficients defining the effects of angle of attack, angle of sideslip, upper flap deflection, and rudder deflection on flight measured vertical tail loads are presented in terms of linear equations. Portions of two maneuver time histories are presented to illustrate the magnitude of each of these effects. Author

N71-15151# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
DESIGN DATA ON BUCKLING OF SIMPLY SUPPORTED SKEW PLATES (ORTHOGONAL COMPONENTS). PART 1: INDIVIDUAL LOADING
Mahabaliraja and S. Durvasula Nov. 1970 71 p refs
(AE-248-S) Avail: NTIS

The design data on buckling of simply supported skew plates for individual loading cases are presented for a wide range of combinations of side ratio and skew angle. In-plane stresses are represented in terms of othogonal components. The mathematical analysis by Rayleigh-Ritz method expresses the deflection in terms of a double Fourier series of sine functions. The resulting matrix equation is divided into two groups corresponding to buckling modes which are skew-symmetric and skew-antisymmetric respectively. The lower of the two lowest eigenvalues from these two set of equations is the desired critical value. Convergence has been examined in a few typical cases. Numerical results for the buckling coefficients for three types of loading are presented in the form of tables and design curves. Author

N71-15154# Aeronautical Research Labs., Melbourne (Australia).
SCATTER FACTORS IN AIRCRAFT FATIGUE LIFE ESTIMATION
B. C. Hoskin and D. G. Ford Apr. 1970 23 p refs
(ARL/SM-350) Avail: NTIS

An introduction is given to the question of scatter factors in aircraft fatigue life estimation. Considered is the fatigue scatter factor, which is the factor introduced to take account of the

variation in life amongst nominally identical structures subjected to nominally identical fatigue loads. The choice of an appropriate probability distribution for fatigue life and the data which may be used in estimating the parameters in this distribution are discussed. An outline is given of the derivation of a formula for this scatter factor. Some reference is also made to the spectrum scatter factor which is designed to take account of the variability in loads experienced by different aircraft of the same fleet. Then, the combination of these two scatter factors into a total scatter factor is touched upon. Author

N71-15155# Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Building Research.
ELASTIC ANALYSIS OF A PLATE WITH AN EDGE COLUMN USING THE METHOD OF COLLOCATION AND AN EXTENDED METHOD OF IMAGES
N. I. Robinson 1970 33 p refs *Its* Tech. Paper No. 26
(PB-193855) Avail: NTIS CSCL 20K

The method of collocation is used to solve a collection of plate problems under uniform or point loading. For simple shapes, the problems arising from the factor of boundary shape alone are overcome by distributing collocation points along a continuous boundary at equal arc length intervals. Regions of high local disturbance caused by point loads or internal boundaries, close to a straight line external boundary, are effectively annulled by using potential functions placed at the image points of the centres of disturbance. Using this extension of the method of images and the method of collocation, the solution is obtained for a uniformly loaded rectangular panel with a circular column near to or contiguous with a free edge. Author (USGRDR)

N71-15192# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
RESULTS OF MODEL TESTS OF 150 METRE HIGH SMOKE STACK FOR BADARPUR THERMAL POWER STATION Final Report
G. N. V. Rao, S. Durvasula, K. R. Reddy, and S. A. Palaniswamy 23 Feb. 1970 41 p refs
(IWTR-84) Avail: NTIS

Model studies of the wind-excited oscillations of a 150 meter reinforced concrete smoke stack of the Badapur thermal power station are presented. Models of 1/100 scale in aluminum and fibre glass were fabricated and tested. The natural frequencies and mode shapes of the first two modes of the full scale stack as well as the dynamically similar models were calculated using different analytical methods. These frequencies, and also the location of the nodes, were determined by experiment and the agreement is satisfactory. During the wind tunnel tests, measurements of transverse amplitudes of oscillation and streamwise deflections at the tip, as well as dynamic stress at different levels, were made. From these tests, it is concluded that the design based on 450-mm shell thickness at the base is to be used in preference to the 300-mm shell thickness. A significant observation during the tests was that the model consistently tends to oscillate in the fundamental mode whenever the wind stream was either steadily accelerating or decelerating. Author

N71-15193# Skoda Works, Pilsen (Czechoslovakia). Nuclear Power Plants Div.
RESEARCH ON STRENGTH AND RESISTANCE TO BRITTLE FRACTURE OF LARGE BODIES
K. Kalna 1970 16 p refs
(ZJE-82) Avail: AEC Depository Libraries

The determination of the strength and safety of large structures requires the testing of specimens with actual thickness and sufficient width and requires a testing machine of high capacity. A brief description of the machine and the tests which can be made on it is given. Some of the most important results of the research work and the application of these results are presented. Author (NSA)

N71-15194# British Iron and Steel Research Association, London (England). Metallurgy Div.
FRACTURE TOUGHNESS TESTING Bisra Open Report
M. J. May and E. F. Walker [1968] 22 p refs Presented at BISRA/ISI Conf. on Low Alloy Steels, Scarborough, Engl.
(MG/A/53/68) Avail: NTIS

The methods for assessing the fracture toughness of materials, and in particular steels, are reviewed. Two main approaches are considered, one based on transition-temperatures and the other on stress-strain distributions around cracks. One approach, in particular, that of linear elastic fracture mechanics, is presented in detail both from the point of view of basic principles and practical determination of toughness parameters, as it is considered that the basis of this approach is the most advanced to data and facilitates quantitative assessment of the fracture properties of materials. The factors that have to be considered in determining the choice of approach applicable to the selection of materials and avoidance of low stress fracture are briefly discussed in general terms. Author

N71-15195*# Wiggins (J. H.) Co., Inc., Palo Verdes Estates, Calif.
BENDING VIBRATIONAL DATA ACCURACY STUDY
Jon D. Collins, Bruce Kennedy, and Gary C. Hart Se. 1970 155 p refs
(Contract NAS8-25458)
(NASA-CR-102974; TR-70-1066) Avail: NTIS CSCL 20K

A description is presented on the operation of a computer program designed to predict uncertainty in structural modal characteristics based on uncertainty in structural physical properties. The program, entitled VIDAP (Vibrational Data Accuracy Program), can handle both stiffness and mass uncertainty and can work with an arbitrary stiffness matrix or one which involves beam or plate elements. Two examples are included, and their results are compared with Monte Carlo or other independent solutions to confirm the accuracy of the VIDAP solution. It is concluded that the VIDAP theory is substantiated by excellent correlation of results from the four degree-of-freedom system, and can compute eigenvalue statistics very accurately in any size model but has difficulty with the accurate prediction of the eigenvector statistics in large models. A user's manual is included. Author

N71-15301# National Bureau of Standards, Washington. Building Research Div.
WINDLOADS ON BUILDINGS AND STRUCTURES Proceedings of Technical Meeting
R. D. Marshall and H. C. S. Thom (ESSA, Silver Spring, Md.), eds. Nov. 1970 171 p refs Conf. held in Gaithersburg, Md., 27–28 Jan. 1969 *Its* Bldg. Sci. Ser. 30
Avail: SOD $1.75 Catalog No. C-13.29/2:30

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N71-15302# Michigan Univ., Ann Arbor, Mich.

DESIGN AND CONSTRUCTION FOR WHAT WIND LOADS AND WHY

L. C. Maugh *In* NBS Windloads on Bldg. and Struct. Nov. 1970 p 5–8 refs (See N71-15306 05-32)

Avail: SOD $1.75 Catalog No. C-13.29/2:30

The design of various structures for wind forces from the viewpoint of the average structural engineer is considered, by evaluating: (1) wind action upon structural frameworks during construction with emphasis upon the relatively large number of partial or complete failures; (2) the behavior of completed structures of relatively high frequencies when subjected to wind loads. An important factor here is the amount and characteristics of motion in high-rise buildings that will be accepted by the occupants; and (3) some dynamic problems associated with wind forces acting upon structures of low frequencies such as tall chimneys and guyed towers. The above problems are discussed from the need for better design criteria and specifications as well as more exact mathematical analysis and more refined wind measurements. Author

N71-15303# Koppes (Wayne F.), Basking Ridge, N.J.

DESIGN WIND LOADS FOR BUILDING WALL ELEMENTS

Wayne F. Koppes *In* NBS Windloads on Bldg. and Struct. Nov. 1970 p 9–18 refs (See N71-15301 05-32)

Avail: SOD $1.75 Catalog No. C-13.29/2:30

A review of current investigations of local wind loads, both by wind tunnel tests and field measurements, indicates that certain common assumptions regarding the intensity and distribution of building surfaces should be reexamined. Further information regarding the nature of these loads is urgently needed by, and should be more promptly disseminated to, the designers and producers of building wall systems. Author

N71-15304# Brookhaven National Lab., Upton, N.Y.

THE ADEQUACY OF EXISTING METEOROLOGICAL DATA FOR EVALUATING STRUCTURAL PROBLEMS

Irving A. Singer and Maynard E. Smith *In* NBS Windloads on Bldg. and Struct. Nov. 1970 p 23–25 refs (See N71-15301 05-32)

Avail: SOD $1.75 Catalog No. 13.29/2:30

Available meteorological data are usually unsuitable for application to structural problems for a variety of reasons. The most obvious deficiency involves instrument location in the three-dimensional sense. Most meteorological observations have been obtained at low elevation in open country, and they therefore do not reveal the wind structure at the typical heights of modern urban buildings. Furthermore, few of the data have been processed to reflect the turbulent structure of the flow. More subtle problems are involved with the failure of any current programs to define the horizontal structure of turbulence, although a small number of appropriate studies have been made in the vertical. Very important is also the lack of data taken under extreme meteorological conditions, such as thunderstorms and hurricanes. These deficiencies derive in part from the differences in objectives that have led to existing meteorological programs and those that would suit the structural engineer, they are also associated with the failure of the latter to define his requirements. An experimental program that may fill some of the gaps is outlined for discussion and criticism. Author

N71-15305# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

THE CHARACTERISTICS OF ATMOSPHERIC TURBULENCE AS RELATED TO WIND LOADS ON TALL STRUCTURES

George H. Fichtl, John W. Kaufman, and William W. Vaughan *In* NBS Windloads on Bldg. and Struct. Nov. 1970 p 27–41 refs (See N71-15301 05-32)

(NASA-TM-X-66547) Avail: NTIS: SOD $1.75 Catalog No. C-13.29/2:30

An engineering boundary layer wind model based upon data collected at the NASA 150-meter meteorological tower facility at the Kennedy Space Center, Florida is discussed. A statistical power-law peak wind profile is used to extrapolate peak wind statistics valid at the 10 meter to other levels. The relationship between the instantaneous extreme wind profile and the peak wind profile for various periods of exposure up to ten minutes is examined. The gust factor profile, which depends on the peak wind speed, height, and averaging time, is applied to the peak wind profile to obtain a mean wind profile. A spectral model of the longitudinal and lateral components of turbulence for the neutral boundary layer (high wind speeds) is presented. Author

N71-15306# Colorado State Univ., Fort Collins. Fluid Dynamics and Diffusion Lab.

FLUCTUATING MOMENTS ON TALL BUILDINGS PRODUCED BY WIND LOADING

J. E. Cermak, W. Z. Sadeh, and G. Hsi *In* NBS Windloads on Bldg. and Struct. Nov. 1970 p 45–59 refs Supported in part by Metronics Associates, Inc. (See N71-15301 05-32)

Avail: SOD $1.75 Catalog No. C-13.29/2:30

Wind loading on a 1:384 scale model of a building 666 ft high was studied experimentally in a thick-boundary-layer wind tunnel. Measurements of mean velocity and turbulence intensity upstream of the model building verified that the wind tunnel flow was an adequate simulation of atmospheric surface-layer flow over an urban area. Mean pressure distributions and local pressure fluctuations were measured for a variety of upstream roughness conditions and wind direction. Use of a high frequency response pressure-measuring system permitted rms and peak values of the local pressure fluctuations to be determined at numerous points on the building surface. Emphasis was placed on direct measurement of mean and fluctuating overturning moments by means of a strain gage dynamometer. Peak values of the moment fluctuations were found to have a magnitude of + or − 34% of the mean moment.

Root-mean-square values of the moment fluctuations were also determined in an effort to relate the moment fluctuations to the measured pressure fluctuations. Author

N71-15307# National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.

EXPERIENCE WITH WIND PRESSURE MEASUREMENTS ON A FULL-SCALE BUILDING

W. A. Dalgliesh *In* NBS Windloads on Bldg. and Struct. Nov. 1970 p 61–71 refs (See N71-15301 05-32)

Avail: SOD $1.75 Catalog No. C-13.29/2:30

Wind pressure measurements made over a four year period on a 34 story building were used to obtain data for checking and improving wind tunnel techniques of modeling flow characteristics of wind and aerodynamic behavior of buildings. The major problems involved in making field measurements and in comparing them with wind tunnel measurements were found to be: (1) difficulty of establishing a static reference pressure and its relation to the static pressure in the wind tunnel; (2) inadequacy of wind velocity information; (3) lack of stationarity and homogeneity of the velocity field as compared with the wind tunnel situation. Comparisons with model measurements on the basis of mean pressures, rms pressures, power spectra, and the correlation between selected pairs of pressures measured at various points on the building have been found of excellent agreement in almost all respects; for some sind directions the comparisons gave unsatisfactory correlations. The lack of agreement was attributed mainly to differences between indtcated and actual on-site wind direction. Author

N71-15308# Toronto Univ. (Ontario). Dept. of Mechanical Engineering.

INFLUENCE OF ARCHITECTURAL FEATURES ON THE STATIC WIND LOADING OF BUILDINGS

Hans J. Leutheusser *In* NBS Windloads on Bldg. and Struct. Nov. 1970 p 73–86 refs Sponsored by NRC of Can. (See N71-15301 05-32)

Avail: SOD $1.75 Catalog No. C-13.29/2:30

Model tests are used to determine the effects of roof parapets and roof projections onto the roof wind-loading, and of wall mullions (or ribs) onto the wall wind-loading, of bluff building forms. Results are presented which suggest that parapets are effective in equalizing the pressure distribtuion over the roof surface while slightly reducing the uplift force. Roof projections, on the other hand, have the opposite effects. The presence of wall mullions causes saw-tooth like deviations from the peripheral wall pressure distribution for the no-rib case. The deviations are particularly significant in regions of attached flow and tend to become more pronounced with an increase in rib spacing. Author

N7115310# Western Ontario Univ., London. Faculty of Engineering Science.

ON THE RELIABILITY OF GUST LOADING FACTORS

Barry J. Vickery *In* NBS Windloads on Bldg. and Struct. Nov. 1970 p 93–104 (See N71-15301 05-32)

Avail: SOD $1.75 Catalog No. C-13.29/2:30

The accuracy of the simplified gust factor approach to the determination of wind loads is examined. An expression for the gust factor is derived which treats the scale of turbulence, mode shape of vibration, and parameters defining the vertical and crosswind cospectra as variables. The method formulated in this paper differs from previous methods primarily in the size reduction factor and in the form of the spectrum of velocity fluctuations. Predicted values of gust factors are compared with those observed on eight different aeroelastic models tested in a boundary layer wind tunnel. The gust factor relates only to overall loads in the mean wind direction. Where basic data are well defined, the ratio of expected peak values of wind induced stress or deflection to their average values can be predicted to an accuracy of typically five percent to 10 percent. Author

N71-15311# Skilling, Helle, Christiansen, Robertson, New York, N.Y.

THE TREATMENT OF WIND IN THE DESIGN OF VERY TALL BUILDINGS

Leslie E. Robertson and Peter W. Chen *In* NBS Windloads on Bldg. and Struct. Nov. 1970 p 107–114 refs (See N71-15301 05-32)

Avail: SOD $1.75 Catalog No. C-13.29/2:30

Described are some highlights of a study of the wind effects for the design of the United States Steel Office Building in Pittsburgh, Pennsylvania. Three types of models were used in a boundary layer wind tunnel to obtain data of the wind effects on the building. The wind tunnel results were combined with Weather Bureau data to obtain statistical estimates of the design parameters. These paramaters included the envelopes of maximum deflections, the contours of maximum and minimum wind pressures on the exterior walls, and the expected number of cycles of oscillation per year which exceeds specific values of acceleration and of deflection. Author

N71-15312# Ammann and Whitney, New York.

DYNAMIC RESPONSE OF TALL FLEXIBLE STRUCTURES TO WIND LOADING

Joseph Vellozzi and Edward Cohen *In* NBS Windloads on Bldg. and Struct. Nov. 1970 p 115–128 refs (See N71-15301 05-32)

Avail: SOD $1.75 Catalog No. C-13.29/2:30

Presented and discussed are methods of calculating the dynamic responses of tall, flexible structures, such as towers, stacks and masts, to wind loading. The first part deals with the dynamic responses of cylindrical structures to vortex shedding and the second part deals with dynamic responses to gust loading. Author

N71-15313# California Univ., Berkeley. Div. of Structural Engineering and Structural Mechanics.

SOME DEFICIENCIES IN CURRENT METHODS OF ANALYSIS

R. W. Clough *In* NBS Windloads on Bldg. and Struct. Nov. 1970 p 129–131 (See N71-15301 05-32)

Avail: SOD $1.75 Catalog No. C-13.29/2:30

Deficiencies in methods of analysis for structures subjected to wind forces are considered. Areas of similarity between wind and seismic forces and their treatment by current building codes are discussed. Deficiencies include a neglect of the dynamic nature of the wind problem, a lack of basic information, and an inadequate definition of acceptable levels of risk. Author

N71-15314# California Univ., Los Angeles.

COMBINING A WIND TUNNEL ANALYSIS WITH A THREE-DIMENSIONAL ANALYTIC BUILDING ANALYSIS

Gary C. Hart *In* NBS Windloads on Bldg. and Struct. Nov. 1970 p 145–149 refs (See N71-15301 05-32)

Avail: SOD $1.75 Catalog No. C-13.29/2:30

A three-dimensional computer oriented stiffness representation of a high-rise building is described. Statistical quantities obtained from aeroelastic models in a boundary layer wind tunnel are combined with the three-dimensional analytical building model to obtain a probabilistic description of the building's response. The response is expressed in terms of the mean and covariance of floor displacements and stresses in the structural members. The procedure is intended to provide a more realistic combination of the aerodynamic and structural behavior of a high-rise building. Author

N71-15315# Cornell Univ., Ithaca, N.Y.
THE ENGINEERING INTERPRETATION OF WEATHER BUREAU RECORDS FOR WIND LOADING ON STRUCTURES
S. C. Hollister *In* NBS Windloads on Bldg. and Struct. Nov. 1970 p 151–164 refs (See N71-15315 08-32)
Avail: SOD $1.75 Catalog No. C-13.29/2:30

Utilized are records of the fastest mile as published by the United States Weather Bureau from data obtained at their airport stations, to develop wind loadings on engineering structures. Analyzed are gusts and it is shown how gust loadings should be dealt with in structural design. Roughness of terrain and extent of cover in rural and urban localities are systemized for engineering purposes. Occurrence of extreme winds is extended to a stage where a practical code may be written. Finally, designing for a given structural life and for a desired level of risk is discussed. Author

N71-15319# Aerospace Corp., San Bernardino, Calif.
BOMS 2, BUCKLING OF STIFFENED MULTILAYERED CIRCULAR CYLINDRICAL SHELLS WITH DIFFERENT ORTHOTROPIC MODULI IN TENSION AND COMPRESSION Technical Report, Mar.–Aug. 1970
Robert M. Jones 14 Aug. 1970 74 p refs
(Contract F04701-70-C-0059)
(AD-713113; TR-0059(S6825-2); SAMSO-TR-70-339) Avail: NTIS CSCL 20/11

An exact buckling criterion, within the framework of classical buckling theory, is derived for eccentrically stiffened multilayered circular cylindrical shells made of materials that have different orthotropic moduli in tension and compression. Such behavior is typical of many current composite materials. The buckling criterion is valid for arbitrary combinations of axial and circumferential loading, including axial compression and internal pressure as well as axial tension and lateral pressure. The material model (stress-strain relationship) involves a bilinear stress-strain curve with a discontinuity in slope (modulus) at the origin. A numerical example of buckling of a ring-stiffened two-layered circular cylindrical shell is given to illustrate application of the buckling criterion. A FORTRAN 4 computer program, BOMS 2, that implements the aforementioned analysis is described and listed. Author (TAB)

N71-15340# Army Materials and Mechanics Research Center, Watertown, Mass.
EXPLOITATION OF CONTOURED DOUBLE CANTILEVER BEAM SPECIMENS IN CRACK GROWTH AND ARREST STUDIES
Joseph I. Bluhm, Bennett E. Gordon, Jr., and Robert J. Morrissey 1970 14 p refs
(AD-713512) Avail: NTIS CSCL 20/12

Although the characterization of crack stability is an important attribute of this specimen and the one which this paper treats, other desirable features are noted. Multiple toughness determinations can be obtained in a single specimen. The control of pop-in lengths and the accompanying velocity changes poses further the possibility of using this specimen for study of strain rate effects on toughness and for studying the dynamics characteristics of crack propagation. TAB

N71-15341*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
THEORETICAL CONSIDERATIONS OF SOME NONLINEAR ASPECTS OF HYPERSONIC PANEL FLUTTER Annual Report, 1 Sep. 1967–31 Aug. 1968
S. C. McIntosh and J. I. Lerner 31 Aug. 1968 42 p refs
(Grant NGR-05-020-102)
(NASA-CR-115854; AR-3) Avail: NTIS CSCL 20K

The stability and response of a panel of infinite width on hinged supports, including a critical evaluation of the important nonlinear aerodynamic terms and the effects of turbulent boundary layer are discussed. Purposes of the research project are: (1) to study the effects on panel response and stability of nonlinear, nonviscous aerodynamic loading at hypersonic Mach numbers and (2) to determine theoretically the effects of turbulent boundary layer on the aerodynamic loading of an oscillating panel. Author

N71-15342# Newark Coll. of Engineering, N.J. Dept. of Mechanical Engineering.
DIGITAL COMPUTER PROGRAM FOR APPROXIMATE STRESS-CONCENTRATION ANALYSIS FOR A NOZZLE IN A SPHERICAL PRESSURE VESSEL
Arnold Allentuch and Eugene Colub Sep. 1970 32 p refs
(Contract N00014-67-A-0225-0001)
(AD-713692; NCE-NV-4) Avail: NTIS CSCL 20/11

A computer program is presented which gives the total stress concentration factor caused by a nozzle in a pressurized spherical vessel. The solution on which the program is based is obtained by an approximate method in which only bulk equilibrium and deformation requirements are maintained. The results are compared with available test data. The computer program is written for a General Electric 605 Time Sharing Computer. A complete listing of the program, including full documentation, is presented. In addition, a typical computer run is included. Author (TAB)

N71-15350# Air Force Systems Command, Wright-Patterson AFB, Ohio. Air Force Flight Dynamics Lab.
THE APPLICATION OF COMPUTER GRAPHICS TO MULTIHARMONIC ANALYSIS OF STRUCTURAL SHELLS Technical Report, Sep.–Nov. 1968
Thomas N. Bernstein Aug. 1970 103 p refs
(AD-713101; AFFDL-TR-70-57) Avail: NTIS CSCL 20/11

The report describes a technique, together with the associated computer subroutines required, for graphically displaying the structural response of a shell of revolution subjected to an arbitrary mechanical or thermal load represented by the sum of several Fourier harmonics. Solutions are presented for a typical problem. Author (TAB)

N71-15389# California Univ., Livermore. Lawrence Radiation Lab.
COMPUTER SIMULATION OF FRACTURE
M. L. Wilkins 18 Aug. 1970 32 p refs Presented at the 17th Sagamore Army Mater. Res. Conf., Raquette Lake, N.Y., 1–4 Sep. 1970 Submitted for publication
(UCRL-72640; CONF-700910-1) Avail: NTIS

A technique is described for simulating the propagation of cracks by means of a computer program. Examples are given for cracks propagating in plane-strain and plane-stress geometries. Author (NSA)

N71-15393# Houston Univ., Tex. Dept. of Mechanical Engineering.
SIMULATION WITH MINIMUM EQUIPMENT OF RANDOM VIBRATION INDUCED BY COMPLEX EXCITATION
O. E. Crenwelge, Jr. and D. Muster Aug. 1970 19 p refs
(Contract Nonr-4492(01))
(AD-713141; TR-22) Avail: NTIS CSCL 20/11

Complete simulation of random response induced in service by complex, ergodic, Gaussian excitation requires the exact reproduction of the response spectral densities at all points of the system and the cross-spectral densities between each pair of points. This in turn requires exact reproduction of the service loading. If a less-than-complete exact simulation of the response spectra at and between n system locations is acceptable, this can be accomplished using n discrete random forces. For certain types of systems previous theorization has shown that one discrete

random force can be used to produce simulation which is accurate in the neighborhood of the resonance frequencies and approximate in the vicinity between resonance peaks. These systems must have light damping and widely spaced resonances so that modal coupling does not exist. The discrete random simulation force must have the appropriately shaped spectrum and must be properly located so that all modes will be excited. For systems of this type the theory shows that reproduction of the response spectral density at any one point assures reproduction of the spectral and cross-spectral densities at and between all other points. Author (TAB)

N71-15394# Army Engineer Waterways Experiment Station, Vicksburg, Miss.

RESPONSE OF SELECTED MATERIALS TO HIGH-SPEED FRAGMENT IMPACT

Jerry W. Brown 1970 13 p refs

(AD-713513) Avail: NTIS CSCL 19/4

The eventual objective of the study of fragment mechanics was to obtain information on the ability of various materials to stop the penetration of fragments from indirect fire weapons and to define the optimum orientation of these materials whether used singularly or in combination with each other. Before this main objective could be realized, several intermediate goals had to be reached. A logical method of simulating a fragment by some standard projectile had to be selected, and a facility for propelling the projectile under closely controlled conditions had to be constructed. Researchers had to choose, from among a large number of possible protective materials, those few that best met Army needs regarding availability, cost, weight, ease of construction, and effectiveness. A test program had to be conducted and the accumulated data had to be analyzed in order to categorize the best of the available data. Those materials showing promise in the laboratory were selected for full-scale field testing. This paper describes the handling of each of these steps and lists the conclusions drawn from each phase of the work. TAB

N71-15406# Brown Univ., Providence, R.I. Div. of Engineering.

NONLINEAR MATERIAL AND GEOMETRIC BEHAVIOR OF SHELL STRUCTURES

Georges A. Dupuis, Hugh D. Hibbitt, Sean F. McNamara, and Pedro V. Marcal Sep. 1970 31 p refs

(Contract N00014-67-A-0191-0008)

(AD-713797; TR-3) Avail: NTIS CSCL 20/11

The nonlinear analysis of shell structures is studied by both the Eulerian and the Lagrangian approach. Current methods are discussed on the basis of both formulations. It is found that the widely used updated procedure is a combination of both approaches. From the current standpoint it makes use of a mixture of incremental stiffnesses derived by both approaches. The bowing effect was found to be the main source of error in this updated procedure, and this effect was shown to be negligible when a large number of elements were used. Case studies investigate various aspects of the nonlinear behavior of arches, axisymmetric shells of revolution, flat plates, and arbitrary shells. Author (TAB)

N71-15422*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AN IMPROVED ANALYTICAL TREATMENT OF THE DENTING OF THIN SHEETS BY HAIL

Robert G. Thomson and Robert J. Hayduk Washington Jan. 1971 47 p refs

(NASA-TN-D-6102; L-7343) Avail: NTIS CSCL 20K

Severe structural damage, such as surface erosion, dents, perforations, and tears, can occur when high speed aircraft collide with hailstones. The denting of aircraft skin by hail is mathematically analyzed and the results are compared with experimental data. The denting process is modeled mathematically by assuming that a crushable, spherical hailstone impacts normal to a flat sheet. The resultant dent depth and shape are determined by utilizing an existing computer program which considers both bending and membrane action and elastic and plastic material behavior. The results of this analysis are compared with experimental data from the British Royal Aircraft Establishment and with a previous analysis which considered bending only. The improved analytical treatment of the denting process agrees well with the experimental data and shows that membrane forces must be considered when sheet deflections are large. Author

N71-15423*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

MEASURED AND CALCULATED VIBRATION PROPERTIES OF RING-STIFFENED HONEYCOMB CYLINDERS

James A. Schoenster Washington Jan. 1971 53 p refs

(NASA-TN-D-6090; L-7226) Avail: NTIS CSCL 20K

An experimental and analytical investigation of the dynamic response characteristics of axisymmetric ring stiffened bonded aluminum honeycomb cylinders is described. Good agreement between experiment and a finite element analytical technique was obtained for both frequencies and mode shapes. Investigations into the variation of selected parameters, such as cylinder edge restraint and bending stiffness of the end rings, showed that significant differences were obtained either in frequency while the associated mode shape was only slightly affected or in mode shape while the associated frequency was only slightly affected. Damping values were in the range of those reported for other honeycomb structures. Author

N71-15569*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

COMPUTER PROGRAM FOR FINITE-DIFFERENCE SOLUTIONS OF SHELLS OF REVOLUTION UNDER ASYMMETRIC DYNAMIC LOADING

Wendell B. Stephens and Martha P. Robinson Washington Jan. 1971 67 p refs

(NASA-TN-D-6059; L-6298) Avail: NTIS CSCL 20K

A general computer program written in FORTRAN 4 language which determines the linear asymmetric bending behavior of a statically or dynamically loaded elastic thin shell of revolution is presented. The loading may be applied either mechanically or thermally. The variables are separated by representing the loads, displacements, and stresses by Fourier series expansions in the circumferential direction. The resulting set of equations is solved numerically by using finite difference approximations in the meridional direction and backward differences in the time direction. A three layered cross section which is symmetric about the middle surface is allowed. The boundary conditions are taken in a general form which allows the program to handle elastic restraints specifying a linear combination of edge forces and displacements. Nohomogeneous initial conditions are also allowed. The data input procedure is described in detail and sample calculations are included. Author

N71-15570# Syracuse Univ., N.Y. Metallurgical Research Labs.

FRACTURE MECHANICS FOR DESIGN AND FAILURE ANALYSIS Interim Technical Report

Volker Weiss Aug. 1970 39 p refs

(Contract N00019-70-C-0044)

(AD-713148; MET-VW-1810-10870) Avail: NTIS CSCL 20/12

The present paper is a brief review of how fracture mechanics can be applied to design and failure analysis with particular reference to peak performance structures. After a review of the foundations of fracture mechanics, a description of the testing procedures to obtain the material characteristics, which are to be

used in the material selection, the design and failure analysis is given. Finally, a number of examples representative of how this new discipline of fracture mechanics can be applied to design and failure analysis and the general areas where an extension of the new discipline appears most desirable, are outlined. TAB

N71-15814# Department of Forestry, Vancouver (British Columbia). Forest Products Lab.
ROLLING SHEAR FAILURE OF PLYWOOD IN STRUCTURAL COMPONENTS
R. O. Foschi Dec. 1970 42 p refs
(VP-X-67) Avail: NTIS

A mathematical model for the failure of rolling shear plywood connections was proposed and verified experimentally. It assumes that failure is triggered by longitudinal shear failure of the face ply. It is found that allowable stresses depend upon the width of the area of contact, decreasing with it. For widths of dimension lumber, however, the allowable stresses currently recommended are too conservative and could be increased. A new test assembly, which stimulates the structural behaviour of plywood in a rolling shear connection, was proposed and used to test the mathematical model. It is proposed that this test, and not the standard shear test, be used to assess the strength of plywood in structural applications involving rolling shear. Author

N71-15815 Cornell Univ., Ithaca, N.Y.
FATIGUE OF METALS UNDER COMBINED STRESSES
Mamundi Govindaraman Sri-Ram Aiyer (Ph.D. Thesis) 1969 188 p
Avail: Univ. Microfilms: HC $8.60/Microfilm $3.00 Order No. 70-496

An extensive experimental test program was conducted on two types of steels using notched specimens subjected to combined reversed bending and static torsional loads. The results were analyzed together with those already published in the literature for tests on a variety of materials when subjected to different combinations of stresses. From the analyses of the results it is shown that the important parameters which govern the fatigue behavior of metals in combined stress fatigue are: (1) the maximum shear stress, (2) the maximum range of shear stress, (3) whether or not the planes of maximum shear stress and maximum range of shear stress are the same, and (4) the complementary normal stresses on the planes of maximum range of shear stress. For fatigue under combined stresses two empirical formulas were proposed. The formulas agree closely with available experimental results, particularly on steels, in different states of heat treatment, both notched and unnotched. Dissert. Abstr.

N71-15827*# New York Univ., N.Y. School of Engineering and Science.
THERMAL STRESSES IN CHEMICALLY HARDENING ELASTIC MEDIA WITH APPLICATION TO THE MOLDING PROCESS
Myron Levitsky and Bernard W. Shaffer Sep. 1970 28 p refs
(Grant NGL-33-016-067)
(NASA-CR-115878; S-70-4) Avail: NTIS CSCL 20K

A method has been formulated for the determination of thermal stresses in materials which harden in the presence of an exothermic chemical reaction. Hardening is described as the transformation of the material from an inviscid liquid-like state into an elastic solid, where intermediate states consist of a mixture of the two, in a ratio which is determined by the degree of chemical reaction. Constitutive equations for the transitional mixture are derived from the strain energy of its component parts in a manner consistent with the treatment of a homogeneous elastic material whose properties vary with time. The method is illustrated in terms of an infinite slab cast between two rigid mold surfaces. It is found that the stress component normal to the slab surfaces vanishes in the residual state, so that removal of the slab from the mold leaves the remaining residual stress unchenged. On the other hand, the residual stress component parallel to the slab surfaces does not vanish. Its distribution is described as a function of the parameters of the hardening process. Author

N71-15882# Tyco Labs., Inc., Louisville, Colo. Explosive Fabricators Div.
TEST EVALUATION OF EXPLOSIVELY BONDED CASING-LIFTING RING ASSEMBLIES
Apr. 1970 52 p refs
(Contract AT(26-1)-416)
(NVO-416-2) Avail: NTIS

A test program was conducted to evaluate the characteristics and integrity of casing-lifting ring assemblies. These assemblies were produced by explosively bonding exterior lifting rings to thick wall casing. A total of four assemblies were tensile tested in a five million pound capacity testing machine. In all cases the bonded joints remained intact; however, two of these assemblies failed in the vicinity of the bonded joint. Results from tensile tests on small samples and hardness tests indicated that material properties were unrelated to the mode of failure. It was proposed that a bi-axial stress condition in the vicinity of the joint was related to the mode of failure. Further testing of the bond joints was made by sectioning ring samples from each joint and subjecting the bonds to a shear load. True shear failure on a plane at approximately 45 deg to the bond plane occurred in many of these tests. As a result, an accurate value of bond strength was indeterminant. Average fracture stress value on these samples was 48,100 psi. Author

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N71-14568# Ballistic Research Labs., Aberdeen Proving Ground, Md.
DETONATION STRUCTURE IN CONDENSED PHASE EXPLOSIVES
Philip M. Howe 1969 12 p refs
(AD-713541) Avail: NTIS CSCL 19/4

The purpose of the investigation was to extend some of the results and knowledge of nonsteady effects in the gas phase to liquid and solid explosives, where the physical and chemical conditions are extremely different. It was of considerable interest to determine how general to detonation phenomena transverse structure is and how the structure is affected by the conditions peculiar to liquid and solid explosives. Author (TAB)

N71-14569# Purdue Univ., Lafayette, Ind. Project Squid Headquarters.
COMBUSTION KINETICS OF PARTICULATE BORON
C. M. Kelley (Denver Univ.), R. E. Williams (Denver Univ.), and A. Takemoto (Denver Univ.) Sep. 1970 25 p refs
(Contract N00014-67-A-0226-0005; Proj. Squid)
(AD-713121; SQUID-TR-DEN-1-PU) Avail: NTIS CSCL 21/2

Initial combustion studies were performed with amorphous boron levitated in an electrostatic suspension cage, in an air atmosphere, and ignited by the output of a pulsed neodymium-doped glass laser operating at 1.06 microns. The particles are suspended

in the quadrupole cage composed of four parallel rods, in the form of a square, and two end plates. Opposing pairs of the rods are connected and an AC potential of about 1500 volts is applied to the pairs. The frequency is adjusted to about 80 cycles. The lower plate of the system is held at 720 volts positive and the upper plate at 240 volts positive. The particles are charged with a Tesla coil and some fraction of the particles, having appropriate charge and mass, remain suspended in the field and become the subject for study. Author (TAB)

N71-14589# Eidgenossische Technische Hochschule, Zurich (Switzerland).

SINGLE COMPONENT TWO-PHASE ANNULAR-DISPERSED FLOW IN HORIZONTAL TUBES WITHOUT AND WITH HEAT ADDITION FROM A CONSTANT OR VARIABLE TEMPERATURE SOURCE

Henri Soumerai (Ph.D. Thesis) 1969 146 p refs
(Diss-4322) Avail: NTIS

Current methods of computing total heat transfer between boiling refrigerant and an external constant or a variable temperature heat source are reviewed. It is shown that present computations, based on either arithmetic or logarithmic mean temperature differences, may lead to serious errors, particularly in compact evaporators operating with slightly wet outlet conditions (quality less than 100%) at subcritical fluxes, i.e. in the so-called wet wall boiling regimes. A simple method of predicting total heat transfer for a given geometry over a wide range of operating conditions on the basis of refrigerant pressure drop and corresponding saturation temperature drop is presented. The practical application of the proposed method under typical conditions encountered in refrigeration practice is illustrated in a step by step numerical example. To verify the proposed method, the calculated values were compared to laboratory tests performed under a wide range of controllable conditions. Since the refrigerant pressure drop is an important design parameter, a method of computing two-phase pressure drop under typical conditions encountered in direct expansion refrigeration evaporators (dispersed-annular flow regimes) is presented. Author

N71-14792# Metaalinstituut TNO, The Hague (Netherlands).

INVESTIGATION OF THE CAUSE OF AN EXPLOSION IN THE MAIN MANOMETER AND THE COPPER PIPELINES OF AN OXYGEN BOTTLE CARRIER [ONDERZOEK NAAR DE OORZAAK VAN EEN EXPLOSIE IN DE PRIMAIRE MANOMETER EN DE KOPEREN AANSLUITLEIDINGEN VAN EEN ZUURSTOFFLESSENWAGEN]

P. Breedveld 3 Nov. 1970 4 p In DUTCH
(M70-777-BRE/LEE; A-70/KLu/067; TDCK-56605) Avail: NTIS

Spectrometric and microscopic examinations of a damaged copper feed pipe and monometer supplying the oxygen flow to the connection panel of high pressure oxygen bottles mounted onto carriers in military aircraft revealed the presence of glycerin. It is postulated that the manometer was calibrated with the help of glycerin and that this organic material upon sudden connection with the high pressure oxygen initiated spontaneous combustion. Transl. by G.G.

N71-14805# Massachusetts Inst. of Tech., Cambridge. Heat Transfer Lab.

INVESTIGATION OF HEAT TRANSFER AUGMENTATION THROUGH USE OF INTERNALLY FINNED AND ROUGHENED TUBES Final Summary Report

A. E. Bergles, G. S. Brown, Jr., R. A. Lee, R. R. Simonds, and W. D. Snider Aug. 1970 106 p refs Sponsored by the French (F. W.) Tube Co.; supported in part by Coast Guard and General Motors Corp. Res. Labs.
(DSR-70790-69) Avail: NTIS

Summarized is basic design information for tubes having a random roughness on the inside wall (RID) and tubing having continuous internal fins. Test apparatus and procedures were developed to obtain accurate heat-transfer and friction data for a wide variety of tube geometries using water as the test fluid. For the random roughness the heat-transfer coefficient was above the smooth tube value, for comparable flow conditions, by over 60 percent at a Reynolds number of 30,000. Improvements in performance, based on equal pumping power for augmented and smooth tubes, of about 50 percent were observed. The test program for internally finned tubes established that short spiralled fins produce the greatest improvement in heat transfer. On the basis of equal flow conditions, the heat transfer was improved by over 200 percent; while at equal pumping power, the performance was as high as 170 percent. Author

N71-15027# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.

TAP-A: A PROGRAM FOR COMPUTING TRANSIENT OR STEADY-STATE TEMPERATURE DISTRIBUTIONS

B. L. Pierce and H. J. Stumpf Dec. 1969 123 p Sponsored by AEC
(WANL-TME-1872) Avail: NTIS

The program was developed to solve problems involving heat transfer in multidimensional systems having arbitrary geometric configurations, boundary conditions, initial conditions, and physical properties. The program can be used to evaluate internal conduction and radiation, free and forced convection, radiation at external surfaces, specified time dependent surface temperatures, and specified time dependent surface heat fluxes. NSA

N71-15028# Brookhaven National Lab., Upton, N.Y.

TURBULENT LIQUID-METAL HEAT TRANSFER IN CONCENTRIC ANNULI WITH AXIALLY VARYING HEAT FLUX. TABULATIONS OF EIGENVALUES, EIGENFUNCTIONS, AND SERIES COEFFICIENTS

W. S. Yu and John C. Chen Mar. 1969 79 p refs Sponsored by AEC
(BNL-50183) Avail: NTIS

A solution for turbulent heat transfer in concentric annuli was recently derived and published. To utilize that solution to determine local Nusselt numbers for cases of axially varying heat flux, knowledge of the appropriate eigenvalues, eigenfunctions, and series coefficients is required. These characteristic constants were computed for 60 cases, covering the following ranges of parameters: Pr: 0.006, 0.005, 0.004 (Na at 400 F $\approx$ 1200 F); Re: 10,000, 5 $\times$ 10,000, 100,000, 5 $\times$ 100,000; and r sub o/r sub i: 1.2, 1.5, 2.0, 2.5, 3.0. Values of the first ten terms for the characteristic constants are presented. The governing equations and their solution are summarized and sample calculations are given to indicate how the characteristic constants can be used to determine local Nusselt numbers for any case of arbitrarily varying heat flux. Author (NSA)

N71-15169# Houston Univ., Tex. Dept. of Mechanical Engineering.

THE VAPOR EXPLOSION: HEAT TRANSFER AND FRAGMENTATION. 1: INTRODUCTION TO EXPLOSIVE VAPOR FORMATION

J. E. Bouvier, L. C. Witte, and J. E. Cox Nov. 1969 27 p refs
(Contract AT(40-1)-3936)
(ORO-3936-1) Avail: NTIS

Processes involved in reactions between high temperature materials and relatively cool liquids were examined. Illustrative incidents are described involving the metal, paper, and nuclear industries. The conclusion is drawn that both external and internal forces may contribute to the fragmentation of molten material. Research, both theoretical and experimental, is proceeding into both externally and internally produced fragmentation along with experiments on the mechanism of transition boiling over small particles. NSA

N71-15170# Ohio State Univ., Columbus. Computer and Information Science Research Center.
INFORMATIONAL GENERALIZATION OF ENTROPY IN PHYSICS
Jerome Rothstein Feb. 1970 26 p refs
(Grant NSF GN-534-1)
(PB-192128; CISR-TR-70-24) Avail: NTIS CSCL 20M

Informational generalization of entropy provides a language appropriate to the operational viewpoint. In that language many paradoxes simply dissolve, for the ambiguities inherent in previous ways of talking about them are clearly revealed. Included are famous paradoxes of statistical and quantum mechanics. The crucial role of irreversible phenomena in measurement and for the physical foundation of biology is also clearly shown. The historical importance of operational and thermodynamic considerations for both relativity and quantum mechanics suggests that informationally generalized thermodynamics may play a key role in constructing a satisfactory relativistic quantum theory. USGRDR

N71-15174# Royal Aircraft Establishment, Farnborough (England).
FUNDAMENTALS OF FLUID THERMODYNAMICS [ABRISS DER STROEMUNGSTHERMODYNAMIK]
K. Oswatitsch Aug. 1970 86 p refs Transl. into ENGLISH of German report DLR-FB-69-59
(RAE-Lib-Trans-1474; DLR-FB-69-59) Avail: NTIS

For use in fluid mechanics, an outline of thermodynamics is developed for ideal gases, gases with phase change dissociation, ionization and chemical reactions in general. Thermodynamic equilibrium between two substances and relaxation processes are explained. This leads to a 'two substances model', which is particularly suitable for the presentation of a number of thermodynamic processes occurring in fluid mechanics, i.e. dissociation, in shock waves, combustion and detonation, etc. Finally radiation of gases is treated briefly. Author

N71-15324*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A PARAMETRIC THERMAL ANALYSIS OF AN ISOTOPE BRAYTON HEAT SOURCE DURING STEADY STATE OPERATION
Raymond K. Burns Dec. 1970 46 p refs
(NASA-TM-X-52948) Avail: NTIS CSCL 20M

Results of a thermal analysis to predict the internal temperatures in an isotope heat source during Brayton power system operation are presented. A range of heat source and heat source heat exchanger emissivities which could be expected, a range of heat source fuel load around the nominal 400 watt value, and a range of heat exchanger temperatures around the nominal value for a 1600 F turbine inlet temperature were considered. The type of heat source reentry insulation was also varied. Heat source units configured in a planar array parallel to the heat source heat exchanger and in a pincushion array interleaved with the heat source heat exchanger were considered. Author

N71-15344# Stanford Research Inst., Menlo Park, Calif.
SENSITIVITY FUNDAMENTALS Semiannual Technical Progress Report, 1 Mar. -31 Aug. 1970
2 Oct. 1970 55 p refs
(Contract N00014-70-C-0190)
(AD-713474) Avail: NTIS CSCL 7/4

Sensitivity properties of dinitroalkanes were studied. They included the low-velocity detonation (LVD) wave characteristics of the liquid phase, the relation of shock sensitivity and failure diameter to the flow and the chemical reaction rate behind the shock front, and the kinetics and mechanisms of thermal decomposition of the compounds in the gas phase. The compounds chosen for this study were structurally simple but at the same time have physical properties that permit their use in each phase of the study. The model compounds of the current study are selected dinitropropane isomers. Like the difluoraminoalkane isomers used in previous studies, these compounds are being used so that the results from each experimental technique can be interrelated without having to account for effects caused by different functional groups, amount of carbon content, and chain branching. Author (TAB)

N71-15382# Union Carbide Corp., Oak Ridge, Tenn. Computing Technology Center.
NOTES ON HEATING: AN IBM 360 HEAT CONDUCTION PROGRAM (AND ADDENDUM 1)
W. D. Turner and J. S. Crowell 21 Nov. 1969 84 p refs
(Contract W-7405-eng-26)
(CTC-INF-980-Add-1) Avail: NTIS

The HEATING Program, which was converted to run on the IBM 360 digital computer, is designed to solve steady state and/or transient heat conduction problems in one, two, or three dimensional Cartesian or cylindrical coordinates. Thermal properties, heat generation rates, and boundary conditions are spatially dependent. Heat generation rates and boundary conditions are also time dependent. The mesh spacing can be variable along each axis. There can be as many as 2400 lattice points, 100 regions, 50 materials, and 50 boundary conditions. The extrapolated Liebmann method and a modification of the Aitken delta sup 2 extrapolation process are used to solve the finite difference equations which approximate the partial differential equations for a steady state problem. The difference equations for a transient problem involve the first forward time difference, and thus, the solution is expressed explicitly in terms of the temperatures at the previous time level. Author

N71-15384# RAND Corp., Santa Monica, Calif. Physics Dept.
THE THERMODYNAMICS OF THE ALUMINUM/ALUMINUM VAPOR SYSTEM
F. J. Krieger Aug. 1970 40 p refs
(Contract F44620-67-C-0045; Proj. RAND)
(AD-713095; RM-6335-PR) Avail: NTIS CSCL 7/4

The 15th in a series of mathematical investigations of the thermodynamics of ablative materials, the study considers aluminum over a range of temperatures up to 6000 deg K and pressures up to 1000 atmospheres. Two sets of equilibrium equations are used--one representing a pure gas phase, the other a heterogeneous system of gas and condensed solid or liquid aluminum. The gas phase of the heterogenous chemical system, like the homogeneous gas phase, comprises 3 gaseous species. Computational results are presented in both tabular and graphic form. The latter comprises (a) a conventional Mollier diagram in which specific enthalpy is plotted against specific entropy, with cross plots of temperature, pressure, and molecular weight of moles of condensed aluminum; (b) a plot of volume versus temperature for aluminum; and (c) a plot of vaporization temperature for aluminum and graphite at various pressures. Author (TAB)

N71-15395# Ballistic Research Labs., Aberdeen Proving Ground, Md.
DETONATION PRESSURE MEASUREMENTS IN TNT AND OCTOL
Robert L. Jameson and Albert L. Hawkins 1970 14 p refs
(AD-713547) Avail: NTIS CSCL 19/1

Von Neumann has characterized a one-dimensional detonation wave as a shock wave in the unreacted explosive followed by a reaction zone which ends at a region designated the Chapman-Jouguet plane. Throughout this model there are several points that are important to the physical understanding of the detonation process and to its military and scientific application. These points are the Chapman-Jouguet pressure, the von Neumann

spike pressure and the reaction zone length. Measurements were made of phenomena closely associated with these detonation parameters and values for them are inferred where possible. When difficulties exclude a definitive result the problem is analyzed and possible courses of future action indicated. The two explosives that have been selected for this study are cast TNT and cast Octol. TAB

N71-15396# Drexel Univ., Philadelphia, Pa. Combustion Kinetics Lab.

COMBUSTION KINETICS OF TETRAFLUOROETHYLENE Annual Summary Report, 1 Jul. 1969 - 30 Jun. 1970

Richard A. Matula Jul. 1970 48 p refs
(Grant AF-AFOSR-1606-68)
(AD-713144; DUCK-701; AFOSR-70-2257TR) Avail: NTIS CSCL 7/4

The thermal dissociation of carbonyl fluoride (CF_2O) in excess argon, CF_2O yields $CFO + F$, was studied behind both incident and reflected shock waves. Preliminary kinetic data have been obtained in the temperature and total pressure ranges 2500-3100K and 0.5-14 atmospheres. The reaction was found to be unimolecular, and the pressure and temperature dependence of the CF_2O dissociation rate constant were analyzed with the aid of both the Lindemann and Rice-Ramsperger-Kassel unimolecular theory of reaction rates. Theoretical and experimental values of the spectral absorption coefficient and integrated intensity of the 5.15 micron fundamental band of CF_2O are presented. The experimental and theoretical results are in excellent agreement in the temperature range 300-600K and hence it is proposed that the theoretical model can be used to predict the shape and width of this band as a function of temperature. The burning velocities of mixtures of C_3F_6-O_2, c-C_4F_6-O_2 and c-C_4F_8-O_2 at atmospheric pressure are reported. The peak burning velocity of fluorocarbon-oxygen flames can not be correlated with peak adiabatic flame temperature but they can be correlated with peak calculated equilibrium fluorine atom concentrations. Author (TAB)

N71-15555# Atomic Energy Commission Research Establishment, Riso (Denmark).

CRITICAL LITERATURE STUDY ON SCALING LAWS FOR HEAT TRANSFER AND BURN-OUT IN TWO-PHASE FLOW WITH SPECIAL REFERENCE TO BOILING-WATER REACTORS

Rolf Andersen and Vagn S. Pejtersen Aug. 1969 123 p refs
(RISO-207) Avail: AEC Depository Libraries

The use of correlation analysis and scaling laws for predicting burnout in two-phase flow is discussed on the basis of experimental results from various sources, with emphasis on experiments with water and Freon. It is concluded that these methods have so far met with only moderate success, and the use of azeotropes is proposed. It is shown that this may lead towards better understanding of scaling laws. A short survey of concepts such as similitude, dimension, dimensional analysis, fractional analysis of overall equations, and fractional analysis of governing equations and conditions is attempted. Author (NSA)

N71-15556 Kansas State Univ., Manhattan.

THERMAL SCALE MODELING OF A HEAT PIPE

Francis Wilford Holm (Ph.D. Thesis) 1969 82 p
Avail: Univ. Microfilms: HC $4.40/Microfilm $3.00 Order No. 70-4814

A thermal scale modeling program was instituted for the purpose of providing a method for predicting the performance characteristics of a heat pipe from the experimental behavior of a dimensionally and thermally similar (model) heat pipe. The equations for two specific modeling techniques, a technique preserving materials between model and prototype and a technique maintaining the same heat flux in both model and prototype, are derived. The similarity relations for the first modeling technique (material preservation) were verified by experiment and the similarity relations for the second modeling technique (heat flux preservation) are presented without experimental verification. Experiments were performed with two heat pipes (one model and one prototype) fabricated from identical materials. These heat pipes were tested in a high vacuum, cold wall environment without simulated solar, planet, or albedo radiation. Separate experiments were performed on the same two heat pipes to investigate the pumping capabilities of the wick. Dissert. Abstr

N71-15568* Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development.

GAS COOLED HIGH TEMPERATURE THERMOCOUPLE Patent

George J. Zellner, inventor (to NASA) Issued 20 Oct. 1970 (Filed 6 Mar. 1968) 4 p Cl. 136-228; Intl. Cl. H01v1/04 Sponsored by NASA
(NASA-Case-XLE-09475-1; US-Patent-3,535,165;
US-Patent-Appl-SN-710945) Avail: US Patent Office CSCL 20M

A thermocouple probe is described in which a tube of noncircular cross section is disposed in a closed-end tubular sheath having a layer of insulation on the inner surface. Apertures are provided in the tube at the end near the closed end of the sheath. An insulated wire is disposed along the axis of the sheath and joined at the closed end of the sheath to the tube. The sheath is retained in a housing having cooling fluid inlet and outlet which are in communication with passages formed by the noncircular tube. Official Gazette of the U.S. Patent Office

N71-15589# Idaho Nuclear Corp., Idaho Falls.

MOXY: A DIGITAL COMPUTER CODE FOR CORE HEAT TRANSFER ANALYSIS

D. R. Evans Aug. 1970 31 p refs
(Contract AT(10-1)-1230)
(IN-1392) Avail: NTIS

The core heat transfer code MOXY was developed for predictive and post-test analysis of core heat transfer during LOCA. The code employs models that describe thermal radiation, conduction, and convection to steam, and incorporates the following advances in the heat transfer models over previous versions: the fuel rod and sink conduction models use an implicit numerical integration technique that has unconditional numerical stability; and the code solves a three-dimensional core model. The code developed has been evaluated by comparisons between calculated rod surface temperatures and experimental temperatures. These comparisons indicate that the assumptions in MOXY regarding gray diffuse surfaces and symmetry are realistic. Author

N71-15601# P. E. C. Research Associates, Inc., Louisville, Colo.

STUDY OF INTERFACIAL CONDUCTIVITY Final Report

R. Sexl, H. Sexl, and D. G. Burkhard [1970] 149 p refs
(Contract NAS8-30171)
(NASA-CR-102989) Avail: NTIS CSCL 20M

An expanded and improved version of the statistical theory of interfacial thermal conductivity and several applications of this theory, including numerical tables predicting the values and fluctuations of the heat flow for various surface profiles, is presented. Results of a literature survey on the theory of crystal growth under zero gravity conditions are also included. A.L.

N71-15602*# Dyna-Therm Corp., Cockeysville, Md.

STUDY TO EVALUATE THE FEASIBILITY OF A FEEDBACK CONTROLLED VARIABLE CONDUCTANCE HEAT PIPE

Patrick J. Brennan Sep. 1970 69 p refs
(Contract NAS2-5722)
(NASA-CR-73475; DTM-70-4) Avail: NTIS CSCL 20M

Preliminary designs have been completed for both active and passive feedback controlled variable conductance heat pipe systems. In general, an active system appears to have greater design flexibility while at the same time giving sharper temperature control than an equivalent passive system. Author

N71-15616 Arizona State Univ., Tempe.
VELOCITY DISTRIBUTIONS AND HEAT TRANSFER WITH FILM COOLING NEAR A SINGLE, ANGLED, SPANWISE-CONTINUOUS INJECTION SLOT: A NUMERICAL AND EXPERIMENTAL STUDY
Herbert Jackson Carper, Jr. (Ph.D. Thesis) 1969 209 p
Avail: Univ. Microfilms: HC $9.45/Microfilm $3.00 Order No. 70-4850

The objectives of the investigation are to acquire velocity profiles and heat transfer coefficients immediately down stream of the injection sites. The data are to be used to determine if the near slot region is amenable to treatment using existing numerical solution techniques. Velocity profiles were obtained for the region from the injection site to 14 slot widths downstream, and average heat transfer coefficients were obtained for a constant surface temperature plate of the same length. Mass velocity ratios between the secondary and primary flows of zero to unity were covered. The experimentally obtained velocity profiles were used in various ways as input to the existing Spalding-Patankar numerical scheme for solution of hydrodynamic and thermal boundary layers. The experimental data are used for guidance to construct suitable profiles for input to the numerical method which, using Prandtl's mixing-length hypothesis, predicts the experimental velocity profiles reasonably well throughout the region under investigation. Heat transfer predictions are not completely satisfactory. Dissert. Abstr.

N71-15623* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ABLATION STRUCTURES Patent
Andre J. Meyer, Jr., inventor (to NASA) Issued 6 Sep. 1966 (Filed 13 Jan. 1965) 7 p Cl. 60-35.6
(NASA-Case-XMS-01816; US-Patent-3,270,503; US-Patent-Appl-SN-425364) Avail: US Patent Office CSCL 20M

The design, development, and characteristics of ablative structures are discussed. The characteristics of the proposed system are: (1) an outer layer forming a surface exposed to the heat, (2) a plurality of inner layers arranged parallel to and integral with the outer layer, and (3) a means in each layer for allowing gases generated upon heating to readily vent towards the exposed surface. P.N.F.

N71-15625* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BLACK-BODY FURNACE Patent
James Robert Branstetter and Allen J. Metzler, inventors (to NASA) Issued 26 Jul. 1966 (Filed 30 Oct. 1963) 5 p Cl. 13-26
(NASA-Case-XLE-01399; US-Patent-3,263,016; US-Patent-Appl-SN-320233) Avail: US Patent Office CSCL 20M

The development of a fast response, black-body furnace for radiant heat sensing instrument calibration is described. The black body source is formed in a hollwed graphite rod. The graphite rod is mounted from a water cooled housing coaxially with an insulating sleeve and terminates short of the front portion of the sleeve. Heat for the graphite rod is inductively provided by an RF coil which is also water cooled to prevent overheating and a base mounted filament lamp for focusing on the most uniformly radiating wall of the black body source. P.N.F.

N71-15632*# Hughes Aircraft Co., El Segundo, Calif. Space Systems Div.
RADIATION INTERCHANGE FACTORS Quarterly Report, 7 Jun. - 1 Sep. 1968
1 Sep. 1968 95 p refs
(Contract NAS9-7980)
(NASA-CR-115882; SSD-80339M; QR-1) Avail: NTIS CSCL 20M

The objective of Phase I is to develop an efficient computer program which will determine radiation interchange factors among surfaces having any combination of the following properties: (1) diffuse emittance and reflectance, (2) diffuse emittance and specular reflectance, (3) diffuse emittance and reflectance having diffuse plus specular components, and (4) directional emittance and absorptance and bi-directional reflectance. The program must be fast in operation, capable of handling large numbers of surfaces, and is to make maximum use of existing programs as building blocks. Accomplishments centered about completion of the analysis and formulation of the overall program. The objectives of Phase II are to examine techniques for obtaining thermal radiation interchange factors experimentally and to recommend a preferred approach for further development. A technique has been postulated and activities have centered around the establishment of a firm analytical base for this method and a sources and sensors survey geared to its particular requirements. Author

N71-15638*# AiResearch Mfg. Co., Los Angeles, Calif.
PRELIMINARY DESIGN STUDY OF NUCLEAR BRAYTON CYCLE HEAT EXCHANGER AND DUCT ASSEMBLY (HXDA). PHASE 3 Topical Report
M. G. Coombs, C. J. Morse, and C. E. Richard 4 Jan. 1971 169 p
(Contract NAS3-13453)
(NASA-CR-72816; Rept-70-7045) Avail: NTIS CSCL 20M

The preliminary designs of two Brayton-cycle heat exchanger and duct assemblies (HXDA's) suitable for operation with a liquid metal cooled reactor are developed. One system was designed to be compatible with the SNAP-8 reactor capabilities i.e., 1150 F (894 K) turbine inlet temperature and 300 kw sub t, while the other system requires more advanced reactor capabilities, 1600 F (1144 K) turbine inlet temperature and 650 kw sub t. Author

N71-15639*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COMPOSITION DISTRIBUTION AND EQUIVALENT BODY SHAPE FOR A REACTING, COAXIAL, SUPERSONIC HYDROGEN-AIR FLOW
Griffin Y. Anderson, Anthony M. Agnone, and William Roger Russin Washington Jan. 1971 42 p refs
(NASA-TN-D-6123; L-7498) Avail: NTIS CSCL 20M

Results of an experiment with an ambient temperature Mach 2 hydrogen jet mixing and reacting with an ambient temperature Mach 2 air stream are presented and analyzed. Combustion of the hydrogen jet was piloted by reaction in a low velocity annular oxygen flow between the hydrogen and air flows. Pitot pressures measured in the air flow outside oh the mixing-reacting region were used with an inverse application of the method of characteristics to calculate streamlines and deduce an equivalent nonreacting flow body shape to represent the burning jet. Expansion waves generated by a rectangular duct placed around the jet were found to produce no large change in the mixing and reaction between the hydrogen and air streams. Gas samples abstracted from the mixing-reacting region were used to match theoretical turbulent mixing calculations with the experimental data. Streamlines from the inverse application of the method of characteristics and from mixing computations are identical outside the mixing region near the jet exit. Measured Mach number profiles across the flow for the nonburning and burning cases match mixing computations for the same value of turbulent viscosity, implying that chemical reaction does not affect mixing rate under the conditions of this experiment. Author

N71-15641# Lockheed Missiles and Space Co., Sunnyvale, Calif.
TRANSIENT HEAT TRANSFER GAUGE Patent
Allen D. Wood, inventor (to NASA) Issued 6 Oct. 1970 (Filed 5 Oct. 1967) 6 p Cl. 73-190; Int. Cl. G01k17/00 Sponsored by NASA
(NASA-Case-XNP-09802; US-Patent-3,531,989; US-Patent-Appl-SN-673229) Avail: US Patent Office CSCL 20M

A gage is described which is capable of measuring total radiant intensity from vacuum ultraviolet and ionized high temperature gases. The gage includes a thermally thick radiation absorbing metal disk of sufficient thickness to prevent penetration of photons. It has one surface exposed to the radiation and a strain sensitive piezoelectric crystal bonded to the opposite surface. The disk responds to the radiation heat flux by thermally induced radial strain. The strain sensitive crystal, on sensing the mechanical stress waves propagated through the disk, develops a charge between the crystal faces proportional to the heat flux.
Official Gazette of the U.S. Patent Office

N71-15651# Skoda Works, Pilsen (Czechoslovakia). Nuclear Power Plants Div.
DIMENSIONLESS THERMAL STRESS IN A PLATE [DIMENSIONSLOSE WAERMESPANNUNG IN DER PLATTE]
C. Fojticek 1969 42 p In GERMAN
(ZJE-63) Avail: AEC Depository Libraries

Equations for one dimensional heat transfer in an infinite plate, which is insulated from heat on one side and exposed to time-dependent exponential temperature changes on the other side, are derived in dimensionless form and used to express stress. The numerical solution is programmed in computer code ELLIOT. The relationships for dimensionless maximum thermal stress are calculated, tabulated, and presented graphically. An associated dimensionless critical time factor is also calculated and tabulated.
Author (NSA)

34 GENERAL

Includes reports of a broad nature related to industrial applications and technology, and to basic research; defense aspects; law and related legal matters; and legislative hearings and documents.

N71-14567# National Aviation Facilities Experimental Center, Atlantic City, N.J.
SYSTEM SHAKEDOWN TESTS (C30/60N) NAS EN ROUTE STAGE A MODEL 1, FUNCTIONAL PACKAGE B Final Report, Mar. – Oct. 1969
Joseph Lavy et al Dec. 1970 147 p refs Sponsored by FAA
(FAA-NA-70-31) Avail: NTIS

System shakedown tests were conducted as needed to identify and aid in the resolution of hardware and software problems in achieving stable, acceptable, and reliable operation of the NAS En Route Stage A Model 1 System. Controller, engineering, and maintenance personnel were integrated into the system for identifying and resolving problems in the man/machine interface area. Four test phases, identified in total as C30/60 testing, included investigation of (1) computer program functions and operational test procedures, (2) baseline verification of modified operational computer programs, (3) system failure and recovery, and (4) procedures for radar control to allow either partial or full system testing while simultaneously controlling live traffic without derogating safety of the operation.
Author

N71-15140# Atomic Energy of Canada, Ltd., Chalk River (Ontario). Chemistry and Materials Div.
CHEMISTRY AND MATERIALS DIVISION Progress Report, 1 Apr. – 30 Jun. 1970
30 Jun. 1970 119 p refs
(AECL-3665; PR-CMs-13) Avail: Atomic Energy of Can., Ltd., Chalk River: $2.50

Progress is reported on ion penetration, electron microscopy, radiation damage, nuclear methods of analysis, nuclear chemistry, and superconductivity; analytical chemistry, fuel analysis, radioactivity measurements, heavy water analysis, electrochemistry, spark-source mass spectrometry, and mass spectrometry; radiation chemistry, isotope chemistry, surface chemistry, ceramic studies, and metal physics. Progress is reported from McMaster University on ternary fission studies and from the University of Western Ontario on X-ray diffraction analyses of oxide films and effects of oxygen in solid solution in zirconium on the oxide film growth. A topical review on irradiation and precipitation hardening of high-temperature zirconium alloys is also presented.
NSA

N71-15171# National Science Foundation, Washington, D.C.
GUIDE TO PROGRAMS
Jan. 1970 86 p
(PB-193166; NSF-70-14) Avail: SOD $0.75; NTIS CSCL 05B

This guide is designed to provide summary information about support programs of the National Science Foundation, and is intended as a source of general guidance for institutions and individuals interested in participating in these programs. Program listings describe the principal characteristics and basic purpose of each activity, eligibility requirements, closing dates (where applicable), and the address from which more detailed information brochures, or application forms may be obtained.
Author (USGRDR)

N71-15172# Peat, Marwick, Livingston and Co., Washington, D.C.
NATIONAL INTERCITY TRAVEL: DEVELOPMENT AND IMPLEMENTATION OF A DEMAND FORECASTING FRAMEWORK Final Report
Raymond H. Ellis and Paul R. Rassam Mar. 1970 160 p refs
(Contract DOT-TS-542)
(PB-192455) Avail: NTIS CSCL 13B

The development and application of a prototype methodology for predicting national passenger travel demands are described. It specifically takes account of competition among four modes; air, rail, bus and auto. Forecasts are prepared for the years 1975, 1980 and 1990. Interpretation and use of these forecasts should be considered within the exploratory context of the study.
Author (USGRDR)

N71-15197# California Univ., Berkeley. Lawrence Radiation Lab.
INORGANIC MATERIALS RESEARCH DIVISION Annual Report, 1969
May 1970 263 p refs
(Contract W-7405-eng-40)
(UCRL-19155) Avail: NTIS

Progress is reported in chemistry, metallurgy, ceramic science, and solid-state physics.
NSA

N71-15198# New England Economic Research Foundation, Boston, Mass.
PROCEEDINGS OF THE ADVISORY PANEL MEETING ON THE PROGRAM FOR THE EASTERN REGIONAL CONFERENCE ON SCIENCE AND TECHNOLOGY FOR PUBLIC PROGRAMS
21 Oct. 1969 39 p Conf. held at Cambridge, Mass., 2 – 3 Apr. 1970 Sponsored by NSF
(PB-192329) Avail: NTIS CSCL 05A

Programmatic, structural, and organizatorial aspects of science and technology relations with all levels of civilian management and the government are discussed.
G.G.

N71-15199*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MANAGEMENT: A CONTINUING BOOK BIBLIOGRAPHY WITH INDEXES
Jane S. Hess, comp. Nov. 1970 213 p refs
(NASA-TM-X-66546; LL-BIBL-1) Avail: NTIS CSCL 05A

This bibliography is a comprehensive listing of books covering the management sciences in the Langley Library collection through April 1970. The guidelines used in compiling the bibliography are as follows: (1) no journal articles have been included; however, a list of management and management-related journals is given in an appendix; (2) no report literature has been included since it is being adequately covered elsewhere, (3) the format has been patterned after SP-7500; (4) the bibliography covers old as well as modern techniques of management, including applications of computers and statistical methods. Author

N71-15251*# National Aeronautics and Space Administration, Washington, D.C.
RESEARCH AND TECHNICAL OPERATING PLAN SUMMARY. FISCAL YEAR 1971 RESEARCH AND TECHNOLOGY PROGRAM
[1971] 332 p refs
(NASA-TM-X-66566) Avail: NTIS CSCL 05A

A series of abstracts and technical summaries are presented on various rocket propulsions, space vehicle and electronic systems, aeronautical vehicles, human factors systems, and an aerospace safety research program. Earth observations, launch vehicle development, planetary exploration, physics, astronomy, and lunar sciences supporting research and technology are also cited. J.A.M.

N71-15347*# University of Southern Calif., Los Angeles. Western Research Application Center.
[WESTERN RESEARCH APPLICATION CENTER] Quarterly Report, 1 Aug. – 31 Oct. 1970
31 Oct. 1970 56 p
(Contract NASw-1869)
(NASA-CR-115851; QR-3) Avail: NTIS CSCL 05A

The operations of WESRAC, a regional dissemination center for NASA technology and other approved sources, are reported and the material presented includes descriptions of: (1) the physical plant, equipment, and personnel; (2) marketing procedures; (3) engineering and scientific applications; and (4) informations systems. Search highlights and significant areas of technology transfer are also described. D.L.G.

N71-15364# Office of the Chief of Research and Development (Army), Washington, D.C.
PROCEEDINGS OF THE ARMY SCIENCE CONFERENCE. VOLUME 1: PRINCIPAL AUTHORS A THROUGH G
23 Sep. 1970 440 p refs Conf. held at West Point, N.Y., 16 – 19 Jun. 1970
(AD-713500; Rept-7-Vol-1) Avail: NTIS CSCL 5/2

The conference presented a cross section of the many significant scientific and engineering programs carried out by the Department of the Army. The proceedings of the conference are a compilation of all papers presented at the conference and the supplemental papers that were submitted. TAB

N71-15365# Office of the Chief of Research and Development (Army), Washington, D.C.
PROCEEDINGS OF THE ARMY SCIENCE CONFERENCE. VOLUME 2: PRINCIPAL AUTHORS H THROUGH L
24 Sep. 1970 371 p refs Conf. held at West Point, N.Y., 16 – 19 Jun. 1970
(AD-713533; Rept-7-Vol-2) Avail: NTIS CSCL 5/2
For abstract, see N71-15364.

N71-15366# Office of the Chief of Research and Development (Army), Washington, D.C.
PROCEEDINGS OF THE ARMY SCIENCE CONFERENCE. VOLUME 3: PRINCIPAL AUTHORS M THROUGH Z
24 Sep. 1970 389 p refs Conf. held at West Point, N.Y., 16 – 19 Jun. 1970
(AD-713561; Rept-7-Vol-3) Avail: NTIS CSCL 5/2
For abstract, see N71-15364.

N71-15372# Royal Aircraft Establishment, Farnborough (England).
SIMULATION OF AERIAL COMBAT [SIMULATION VON LUFTKAEMPFEN]
Juerg Kohlas (Ph.D. Thesis – Zuerich Univ., 13 Feb. 1967) Oct. 1969 106 p refs Transl. into ENGLISH of German thesis
(RAE-Lib-Trans-1367) Avail: NTIS

The analysis of the probability of survival is an important part of the evaluation of the effectiveness of fighters. There are three interdependent aspects to be considered in the study of the probability of survival against hostile interceptors, namely the problems of encounter, detection, and success or failure after detection. Every pilot controls his aeroplane according to a set of tactical decision rules taking into consideration present and past information of the air combat. Several sets of decision rules corresponding to distinct tactics may be provided. Aeroplanes are controllable in the three-dimensional space and their axial acceleration can be controlled through regulation of the thrust. Several aeroplanes may be engaged on both sides in an air combat. Some examples of flight paths have been computed and their graphs are displayed in the text. Author

N71-15390# Civil Aeronautics Board, Washington, D.C.
ADDRESS BY THE HONORABLE ROBERT T. MURPHY, MEMBER, CIVIL AERONAUTICS BOARD, BEFORE THE GOVERNOR'S TRANSPORTATION CONFERENCE: PRESS RELEASE
Robert T. Murphy 26 Aug. 1970 8 p Conf. held in Casper, Wyo., 25 Aug. 1970
Avail: Issuing Activity

A discussion is presented concerning the problems confronting local airlines in providing service to rural areas of the United States. The possibilities are explored for providing commuter airline service particularly to some of the growing Wyoming communities which do not presently have air service. Major emphasis is placed on arrangements for substitution of third level commuter airlines for the services of scheduled certificated carriers. D.L.G.

N71-15407# Congress. House. Committee on Science and Astronautics.
FEASIBILITY STUDY REGIONAL AEROSPACE MUSEUM
Washington GPO 1970 46 p ref Hearings on H.R. 10771 before Comm. on Sci. and Astronaut., 91st Congr., 2d Sess., No. 22, 16 Jul. 1970
Avail: Ad hoc Subcomm. on H.R. 10771

Congressional testimony is reported on a feasibility study for establishing an aerospace museum to preserve historical items related to United States aerospace activities and to communicate to the public information concerning past, present, and future aerospace activities of the U.S. The report is to contain specific findings on (1) the recommended location of the proposed museum, (2) its recommended physical size and design, (3) the estimated total cost, and (4) the economic feasibility of establishing such a museum. R.B.

N71-15464# Utah Univ., Salt Lake City.
MICROWAVE DEVICE AND PHYSICAL ELECTRONICS LABORATORY Consolidated Quarterly Report, 1 Oct.–3 Dec. 1969
R. L. Arnold, J. M. Baird, N. E. Buholz, L. C. Campbell, and P. W. Chen 31 Dec. 1969 73 p refs
(Contracts F44620-68-C-0022; N00014-69-C-0345)
(AD-713157; MDL-Q31; UTEC-MD-70-158) Avail: NTIS CSCL 20/5

Contents: Optical frequency tuning by parametric operation; Carbon dioxide laser; Tunable raman effect in crystals; ring laser studies; An impedance analysis of double-stream interaction in semiconductors; Double-stream interaction under crossed electric and magnetic fields in semiconductors; Investigation of techniques for using microwaves to measure cracks or voids in solid propellants. TAB

N71-15539# National Bureau of Standards, Washington, D.C. Metric Study.
INTERNATIONAL STANDARDS METRIC STUDY REPORT TO CONGRESS Interim Report No. 1
Dec. 1970 150 p refs
(NBS-SP-345-1) Avail: SOD $1.25 Catalog No. 3-13.10:345-1

Preliminary findings, conclusions, and recommendations are given for a continuing study on international measurement standards activities centering on their significance in the transfer of goods and technology. Included are discussions on the U.S. metric study plan and engineering standards usage. Examples of questionnaires used in the U.S. metric study are appended. E.C.

N71-15553*# Alabama Univ. Research Inst., Huntsville. Div. of Graduate Programs and Research.
HUNTSVILLE AIR TRAFFIC FORECAST
David G. Mishkin Oct. 1970 40 p
(Grant NGL-01-002-001)
(NASA-CR-115880; UARI-93) Avail: NTIS CSCL 17G

Huntsville's air passenger traffic is growing at a slower rate than the national average and is not expected to approach the United States' growth rate until 1975. The destinations of Huntsville's originating passengers are forecast to remain relatively unchanged until 1980. Additional data was generated by an onboard survey of departing passengers from the Huntsville-Madison County Jetport This information has been stored on computer cards and will serve as the first in a series of Huntsville air passenger studies. The survey points up the relative importance of NASA, military, and contractor passengers to Huntsville markets. In addition, the survey measures factors that affect the jetport itself, such as transportation choice to the airport, and residence of originating passengers. Author

N71-15557*# Old Dominion Univ. Research Foundation, Norfolk, Va.
TRANSPORTATION NOISE POLLUTION: CONTROL AND ABATEMENT
David O. Dickerson, Franklin D. Hart, J. Darrell Gibson, and Chester E. Jarvis 1970 204 p refs
(Grant NGT-47-003-028)
(NASA-CR-115881) Avail: NTIS CSCL 13B

In a comprehensive attack on the problem of transportation noise pollution, this report discusses the nature of noise and its detrimental effects; projected transportation trends for the next fifteen years and the resulting impact on the noise environment; legal and political aspects of the noise problem; and positive recommendations for controlling and abating transportation noise pollution. Author

N71-15558# Stanford Research Inst., Menlo Park, Calif.
A METHODOLOGY FOR EVALUATING THE CAPACITY OF AIR TRAFFIC CONTROL SYSTEMS Annual Report, Sep. 1969–Aug. 1970
R. S. Ratner et al Oct. 1970 182 p refs
(Contract FA-70-WA-2142)
(FAA-RD-70-69; AR-1) Avail: NTIS

Results obtained in the first year of a multiyear project to develop a methodology for evaluating the capacity of air traffic control systems are described. The meaning of capacity in an ATC system and the relationship of capacities of functional and geographical system elements to system capacity measures is qualitatively analyzed. Capacity is defined in terms of aircraft movement numbers and rates as limited by a number of factors, including safety and performance. The need for a family of computer-based capacity evaluation models is identified, to balance the fidelity required in modeling the ATC process for capacity assessment, against the heavy computational requirements of such modeling. A decomposition concept is applied to achieve this balance. The conceptual design of members of the family, and some preliminary algorithm development, are reported. Members of the family of models are designed to measure each of the capacity limitations associated with system operating strategies, scheduling, and routing, with delays resulting from congestion, with flow control techniques, with separation minima, control procedures, and other safety aspects as they affect aircraft flight paths, and to measure the delays and aircraft movement limitations associated with high workload models. Author

N71-15631# National Science Foundation, Washington, D.C.
FEDERAL FUNDS FOR RESEARCH DEVELOPMENT AND OTHER SCIENTIFIC ACTIVITIES, FISCAL YEARS 1969, 1970, AND 1971, VOLUME 19
Sep. 1970 273 p refs
(NSF-70-38) Avail: SOD $2.00

A comprehensive body of statistical information is provided on the size and scope of Federal obligations for scientific activities, the purposes to which funds are directed, and the important trends in major funding areas. Reported are R&D obligations by agency and agency subdivision, the character of the work, the performers of the work, and the distribution of research funds by fields of science. Also provided are data on R&D plant, on scientific and technical information activities, general purpose scientific data, and distrubution of R&D funds by States. Author

N71-15633# Joint Publications Research Service, Washington, D.C.
FORECASTING IN SCIENTIFIC RESEARCH AND DEVELOPMENT
N. Ye. Arkhangelskiy et al 15 Dec. 1970 9 p refs Transl. into ENGLISH from Kibernetika (Kiev), no. 4, 1970 p 124–127
(JPRS-51999) Avail: NTIS

Procedures for stochastic forecast modeling of research and development trends are discussed. Quantitative analysis techniques for evaluating research alternatives are also considered. E.C.

N71-15640*# Denver Research Inst., Colo. Industrial Economics Div.
PROJECT FOR THE ANALYSIS OF TECHNOLOGY TRANSFER Quarterly Report, 1 Apr. 1970–30 Jun. 1970
James P. Kottenstette and James E. Freeman 20 Nov. 1970 92 p refs
(Contract NSR-06-004-063)
(NASA-CR-115876; QR-2) Avail: NTIS CSCL 05A

Thirty-seven cases in which NASA-generated technologies have been transferred to other sectors of the U.S. economy were documented. An examination of the Tech Brief program revealed a number of ways in which the transfer effectiveness of that program might be enhanced, including (1) the regrouping of Tech

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Briefs as general or specific; (2) the use of selective rather than general distribution methods; and (3) the republication of selected Tech Briefs. Author

N71-15648# National Science Foundation, Washington, D.C.
IMPACT OF CHANGES IN FEDERAL SCIENCE FUNDING PATTERNS ON ACADEMIC INSTITUTIONS
15 Oct. 1970 8 p refs
(NSF-70-39) Avail: Issuing Activity

The replies to two surveys conducted in the spring of 1969 and spring of 1970 reveal that expenditures for academic science increased 7 and 8.5 percent, respectively, in these years. Expenditures from non-Federal funds compensate at least in part for the leveling trend of Federal funding. Private institutions, in general, and the largest public institutions reported the most serious curtailment of monies for science, and of federal funds in particular. The information collected indicates that funding for academic science has not kept pace with the combined increases in general enrollment and higher costs. Large numbers of academic officials reported impairment of graduate programs and research, curtailment of facilities and equipment, adverse career and employment impacts, administrative difficulties, and lowered morale of students and science faculty. Author

N71-15649# Congress. Senate. Committee on Government Operations.
TFX CONTRACT INVESTIGATION FROM PERMANENT SUBCOMMITTEE ON INVESTIGATIONS
John L. McClellan Washington GPO 1970 100 p refs Rept. presented by the Comm. on Govt. Operations at the 91st Congr., 2nd Sess., 18 Dec. 1970
(Rept-91-1496) Avail: US Capitol, Senate Document Room

Congressional investigations into the TFX contract award is reported, including a brief summary of the origin of the variable sweep airplane and the original military requirements. The research and development program is examined, and includes early discovery of major technical design problems which led to recommendations to redesign the F-111B. Test pilots' warnings of serious problems from 1965 to 1967 are summarized. The costs of the program and an analysis of the contracts are discussed. An overall summary of the TFX program and the conclusions reached from the hearings are presented. R.B.

N71-15686# Joint Publications Research Service, Washington, D.C.
THE THEORY OF QUESTIONNAIRES
P. P. Parkhomenko 8 Dec. 1970 27 p refs Transl. into ENGLISH from Avtomat. i Telemekh. (Moscow), no. 4, 1970 p 140–159
(JPRS-51947) Avail: NTIS

The construction of different types of optimal questionnaires is studied. These types are questionnaires with complete sets of questions, reliazable questionnaires, and questionnaires with unequal values of questions. The use of algorithms for calculating the lower boundary cost of a circuit through a questionnaire, which allows branches and boundaries, is presented as a simple method for constructing optimal reliazable questionnaires. F.O.S.

N71-15695# General Accounting Office, Washington, D.C.
NEED TO IMPROVE EFFECTIVENESS OF CONTRACTOR PROCUREMENT SYSTEM REVIEWS: DEPARTMENT OF DEFENSE, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION Report to the Congress by the Comptroller General of the United States
B. M. Keller 18 Aug. 1970 39 p refs
(B-169434) Avail: Issuing Activity

The procurement systems of certain government contractors are reviewed. The investigations shows some of the contractors have unacceptable procurement systems. The following changes are recommended: (1) develop definitive standards for approval and/or disapproval of contractors' procurement system, (2) broaden the applicability of the CPSR program to include contractors with largely noncompetitive fixed-price type contracts negotiated on the basis of cost, (3) perform annual in-depth reviews on a more selective basis, (4) explore incentives that will encourage contractors to accept CPSR recommendations on improving their subcontracting practices and (5) encourage full utilization of CPSR reports by CPSR managers to correct noted weaknesses in their program implementation. Author

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Recent Advances in Refractory Alloys for Space Power Systems (NASA SP–245)

The proceedings of a June 1969 conference at Lewis Research Center, called to discuss the properties of refractory alloys at temperatures of 2000° F and above in terms of their application in advanced nuclear space power systems. The material was prepared and presented by contractor personnel from information generated under LeRC contracts. The discussions represent a summary of recent advances in the field, covering strength, stability, creep, fatigue, and fabrication, with emphasis on high-strength tantalum-base alloys. *Paperbound.* 304 pp. Available from the National Technical Information Service, Springfield, Va. 22151, for $3.00.

Assessment and Control of Spacecraft Magnetic Fields (NASA SP–8037)

A new space vehicle design criteria publication in the series on structures. This monograph presents NASA's criteria and recommended practices relative to control of magnetic fields arising from sources within a spacecraft. The information is particularly important for spacecraft whose missions involve measurement of natural magnetic fields. The document provides guidance for assessment of magnetic effects and control of adverse effects in spacecraft design, development, and testing. *Paperbound.* 32 pp. Available from the National Technical Information Service, Springfield, Va. 22151, for $3.00.

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